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NEUROPSYCHOLOGY IN THE LOCAL DIAGNOSIS OF BRAIN DAMAGE

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1.

It is known that the study of the function of separate parts of the brain began with observation of cases of speech pathology.

When, one hundred years ago, P. Broca showed that disease of the anterior parts of the lower frontal convolution of the left hemisphere results in the destruction of *motor speech*, and when twelve years later Wernicke established that impairment of the posterior third of the upper temporal convolution of the left hemisphere leads to a defect of *understanding* of speech, it seemed as if facts had been found which convincingly showed that even the most complex psychological processes are localised in limited parts of the brain and that their destruction could be used for the precise diagnosis of local brain impairment.

It was therefore completely natural that the decades following these discoveries were filled with active searches for facts which would show that disturbances of higher cortical functions in circumscribed brain damage have local significance and that the data from psychology and psychopathology may be widely used for local diagnostics of brain damage. Thus, there began the study of optical agnosia which was looked on as a sign of impairment in the occipital area, the study of apraxia, which after Liepmann's work became the basis for the diagnosis of impairment in the parietal area. The study of alexia, agraphia and acalculia was also widely used in the clinic as symptoms of local brain damage. After Kleist, local significance was attributed even to such general changes as the disturbance of mental activity, or character changes. It appeared that psychological investigation of a patient with local brain damage had solidly entered

neurology and had become one of the most important means of local diagnosis.

This confidence in the clearly local significance of the disturbance of higher mental functions met, however, with a series of substantial objections.

It was Hughlings Jackson, Broca's contemporary and his opponent in discussions of neurology's most important problems, who put forth the idea that a disturbance of higher cortical functions should be regarded as a regression of functional organisation on a lower level rather than as the result of a lesions of circumscribed local parts of the brain, and that the entire interpretation of symptoms, evoked by local brain damage, must be regarded from this much more integrative and dynamic position. A similar position, although it arises from other premises, was formulated by Monakow, one of the most profound and careful neurologists of our century. He expressed the most serious doubts about the possibility of using disturbances of the higher cortical processes for topical diagnosis of brain damage. He pointed out that disturbance of complex symbolic functions (which he referred to under the general term "asemia") may occur even when the most widely distributed parts of the brain are damaged and that agnosia or apraxia may be encountered both in the presence of centres located in the parietal-occipital regions and of centres located in the frontal region. Based on his experience as a neurologist, he considered it necessary to draw a sharp boundary between elementary neurological symptoms (disturbance of sensation, movement, tonus, visual field), which always have a sharp local significance, and complex "asemic" symptoms, which although they are psychologically indisputable, still do not indicate a limited locus and thus cannot be used alone for local diagnosis. An analogous position is held by the representative of the so-called "noetic" school and especially by the prominent neurologist K. Goldstein who has done so much for the analysis of higher cortical functions. Goldstein repeatedly emphasised that disturbance of complex forms of mental activity (for example, disturbance of abstract, categorical thinking) may occur in the presence of practically any localised focus of damage and is essentially devoid of local significance.

Thus, the initial hopes for using disturbance of higher mental functions for local diagnosis of brain damage began to appear unfounded, and the possibility of using psychological symptoms for local diagnosis became a controversial issue.

The contradictions between those investigators who did not make a clear-cut distinction between elementary and higher (mental) brain functions and who tended to interpret both groups of symptoms as the result of damage of limited brain sections, and those investigators who sharply divided elementary and higher (mental) functions and who virtually removed mental processes from local brain structure, had as their basis a simplified, and therefore incorrect, conception of the structure of functions, on the one hand, and of the nature of the symptom, on the other.

Supporters of the first (narrow localisation) approach started with the viewpoint that both elementary and higher (mental) functions must be viewed as an *immediate function of narrowly limited parts of the brain*; therefore they found it possible to speak of zones in which such phenomena as motor and sensory images of words, the function of writing or counting, are "localised," and considered that the loss of these functions is an unequivocal symptom of damage in a corresponding zone of the brain cortex. Supporters of the second (anti-localisation) approach, outwardly beginning from the opposite conception, in fact share the principal position of their opponents. Agreeing that elementary functions are related to narrowly limited parts of the brain, they related higher (mental) functions to the brain as a whole, thereby tying them in a direct fashion with the "brain mass" (Goldstein, 1934; Lashley, 1929) and considered that the disturbance of these functions is an unequivocal symptom of the massiveness or volume of brain damage. That is why the disturbance of higher mental functions was viewed most often by these authors as a "general brain symptom," which indicated only the extent of the damage and was devoid of any local significance.

Contemporary conceptions of the structure of brain "functions" and of the nature of "symptoms" begin from other positions and permit us to reach other conclusions which differ sharply from those just described.

As contemporary neurological research has shown, even such elementary processes as skin or visual sensitivity or such phenomena as the knee-jerk reflex have complex structures and many stages localisations based on of hierarchically structured "centres" (I. N. Filimonov, 1945); therefore disturbances of these functions can be accounted for by the destruction of different links in the system and, as a rule, are symptoms of multiple significance, the local significance of which may be made more exact only as a result of special neurological analysis.

The same can be said about higher mental functions to an even greater degree.

As was shown in the classical research of L. S. Vygotski (1956), and then in A. N. Leontiev's observations (1959), higher mental functions are the result of complex social-historical development. They are formed under the influence of people's concrete activity in the process of their communication with each other and in fact always represent *complex functional systems* based on jointly working zones of the brain cortex.

The fact that concrete perception is carried out with very close participation of eye movements, which investigate the object and select out its most informative signs, and that speech participates by relating the perceived object to a certain class, shows us what a complex structure even a simple act of visual perception has. It is not necessary to speak of the complex structure which such processes as writing, reading, counting and logical operations have, and on what a complex system of inter-working zones they are based. *Only special analyses of the structure of these functions and those physiological mechanisms by means of which they are realised, permit us to grasp their complex structure and to specify more exactly those factors of which they are composed.*

This systemic conception of the structure of higher (mental) functions allows us to approach, from essentially new positions, the analysis of their disturbance in the presence of local brain lesions. It becomes completely understandable that a higher (mental) function may suffer as a result of the destruction of *any link which is a part of the structure of a complex functional system* and, consequently, may be disturbed even when centres differ greatly in localisation. However, and this is especially important, *when one or another link has been lost, the whole functional system will be disturbed in a particular way*, and symptoms of disturbance of one or another higher (mental) function will have a *completely different structure, depending on the location of the damage.* Disturbance of gnosis or praxis, writing or reading, counting or logical operations may occur when topographically different parts of the brain are damaged. But a close analysis may show that the loss of different links or factors, which are evoked by each centre, and which are necessary for the realisation of this process, leads to completely different types of disturbance of these functions. The qualitative description of the disturbance

of these functions, established by close analysis, allows us to evaluate the local significance of the evoked disturbance.

In this way we come again to the position that there is a multiple significance of symptoms, but this position does not in any way deprive these symptoms of their local value. In order to provide a correct evaluation of a symptom and its local significance it is only necessary to carry out a *qualitative analysis of the structure of the symptom.*

This qualitative analysis of the disturbance of higher cortical functions allows us to evaluate the local significance of the symptom and represents one of the fundamental tasks of a new branch of science: neuropsychology.

2.

The best we can do now is to give one example which can be used for illustration of our general approach to the functional organisation of symptoms in cerebral cortex we discussed before.

About half a century ago it was supposed that disturbances of *writing* are a definite symptom and that they can be localized in the posterior part of the second frontal convolution of the left hemisphere. That place was once called the "Exner's center."

The psychological basis of this idea was the naive conception that writing is a system of complex hand movements, and that these "writing habits" are disturbed in cases of lesions of the zone mentioned.

Clinical observations were contradictory to such statements. It was shown that disturbances of writing can be observed in very different zones of the left (dominant) hemisphere: in lesions of premotor and postcentral, parieto-occipital as well as temporal or frontal zones. That means that disturbances of writing are not yet symptoms which have immediate local meaning.

Does it mean we are unable to use disturbances of writing for local diagnostics of injury and the symptom of writing disturbance has no local meaning at all?

Careful observation show a multiple significance of this symptom; but it does not yet mean we are unable to use writing disturbances for local diagnostics of cortical injuries. The essence is that *disturbances of writing have very different structure in different localisation* of

cortical defect, and a careful neuropsychological analysis can single out *different factors underlying different forms of writing defects*; such *qualification of writing defects* makes it possible to use disturbances of writing as a mean for topical diagnostics of brain injury.

We shall try to show how such a neuropsychological qualification of the writing defect can be made.[1]

It is well known that in most indo-european languages writing by dictation or spontaneous writing requires a process of singling out separate sounds (phonemes) from the immediate flow of sounds; these phonemes can be marked by letters (graphemes). It is well known too that this process requires an abstraction of several sound features, specific for every phoneme, and suppressing all features which do not play a significant role in discriminating the meaning of words (pitch, timbre, loudness of the voice, etc.).

If this process is carried out, a man can catch the difference between similar sounding words and write the word "vine" differently from the word "wine" or the word "dome" from "tome"): he may single out separate sounds from the complex of noises which form a complicated group of consonants, for instance, in the word "trouble" or "strange." In that way he can form the basis of writing by an exact acoustic analysis of the elements which constitute the word.

As the facts have shown, this process of complicated acoustic analysis and synthesis, which involves the choice of clear phonemic signs and the generalisation of sounds pronounced with different timbres in clear *phonemes*, is possible when the posterior section of the left temporal lobe (the "zone of Wernicke") is intact. This zone is a secondary part of the cortical apparatus of the acoustic analyser of human speech. If those areas of the brain — in which, as S. M. Blinkov (1955) has shown, there is a bundle of fibres which connect the zone of Wernicke with Broca's zone — are destroyed by some local lesion, a man can no longer easily separate phonemic signs from the sound flow and is also unable to perceive speech directed toward him. He begins to hear speech in his native tongue with the same lack of distinctiveness with which we hear some foreign phonemic system (for instance, Chinese or Georgian). This is *sensory aphasia*, the direct result of disturbance of the system of phonemic hearing.

[1] A detailed analysis of this approach is given in special publications. Cfr. A. R. Luria, Traumatic Aphasia, Moscow, 1947 (English version: Mouton Press, The Hague, 1964); Essays in Psychophysiology of Writing, Acad. Pedagog. Science Press, Moscow, 1950; Higher Cortical Functions in Man, Moscow University Press, 1962 (English version: Basic Books, New York, in print).

An essential result of this primary defect is *disturbance of the ability to write either under dictation or when dictated to*, except when the writing is based on a clear visual image (as in copying or writing well-known words) or when there is a strong motor stereotype (as occurs when a person writes his signature).

This type of disturbance of writing is clearly distinguished by a series of signs. A patient with this kind of disturbance may confuse a series of consonants close to each other in sound — for instance, write the word "sobor" (church) as "zabor" (fence) or "zapor" (bolt) — and will easily miss sounds which are parts of a compound of consonants. The character of the disturbance in writing indicates that there is a pathological state of the left temporal region and leads the investigator to search for other signs which might confirm this proposition.

The process of separating new sounds from oral speech is not a purely auditory act. As experience has shown, establishment of the sound content of words often depends on *articulative analysis*; in order to single out sounds from a word and to clearly separate them it is often necessary to pronounce the word, clarifying its sound components by means of kinesthetic cues for analysis. A clear example of this can be seen by observing a telephone conversation and noting those cases when, in order to understand a difficult or an unusual word, the listener begins to pronounce it loudly. As L. K. Nazarova (1952) has shown in our laboratory, such repetition of the word is especially necessary in the first stages of mastering the habit of writing. It was sufficient to ask a child from the first or second grade to write a given word holding his tongue or widely opening his mouth and the number of mistakes increased five or six times.

All of the above forces us to the conclusion that, for a successful analysis of sounds and for writing, it is necessary that the lower part of the post-central section of the left hemisphere be preserved because this is the cortical apparatus for kinesthetic analysis of oral speech.

Observations have confirmed this position and have showed that destruction of this area, which disturbs the kinesthetic basis of articulation and leads to an "afferent" (or kinesthetic) motor aphasia (A.R. Luria, 1947, 1962), is always reflected in writing. A patient with such destruction loses the ability to clearly distinguish sounds similar in articulation. In his writing there begin to appear specific disturbances of confusion of similar "articulems" which are not encountered in other areas — for example, the exchange of "d" for "n" or "l"

(palatal tongue) or "b" for "m" (labial). We have noticed that patients with this kind of damage would write "khalat" (rabe) as "khadat" or "khanat", or even "stol" (table) as "ston" or "slon".

It is sufficient to see such errors in the writing of a patient for hypothesizing that the damage is post-centrally located and the investigator can, with good justification, search for other signs of damage in this area.

The pre-conditions necessary for writing are not exhausted by the process of evaluating the necessary sound. In order to write a word it is necessary to preserve a certain *sequence of sounds* which guarantees the serial organisation of the sound series.

As a series of observations, published in other sources, have shown (A.R. Luria, 1947, 1962, 1963), this *sequential organisation* of the series of excitations and their transformation into an unitary kinetic melody takes place with the closest possible participation of the anterior sections of the brain, in particular the *pre-motor zones*. It is as a result of the damage of the lower areas of the pre-motor cortex of the left hemisphere (Broca's zone) and their connection with the temporal zone which evoke the syndromes of "efferent" (or kinetic) motor aphasia, whose focal sign is disturbance of the serial organisation of the speech act and the planned transition from one articulation to another.

Destruction of the lower sections of the left pre-motor zones leads not only to disturbance of smooth speech and pathological inertness of the already evoked articulation. It also manifests itself in the process of writing and, what is more, in this case, writing suffers at essentially different links than in the forms described above. This type of patient rather easily handles separate sounds and does not confuse similar articulations, however he easily *loses the necessary sequence of sounds in the word*, changes the order of letters, and in more severe cases, loses the ability to switch from one stereotype to another, substituting an inert perseveration of the scheme of the previous word for the correct word. This is why, in the writing of patients with such localisation, one often encounters errors of misplacing — "onko" or "kono" instead of "okno" (window) — or of perseveration or the inert repetition of the scheme of the previous word — as when "nos" (nose) precedes "kot" (cat) which is then written as "kos". The presence of such errors in writing leads us to assume that there is damage in the frontal regions of the left hemisphere and, in

conjunction with other confirmatory symptoms, allows us to confirm the local diagnosis of the lesion.

Until now we have regarded those processes which precede the act of writing itself, and which guarantee a correct analysis of the factors underlying the written word.

However, the next stage of writing involves the re-coding of the discovered sound structure into letters; the transition from the phoneme to the *grapheme*.

Of course, this process, which in the beginning involves *visuo-spatial* analysis of letters and then the completion of the corresponding series of *movements*, is provided by completely different parts of the brain and is disturbed when damage at other locations occurs.

As a large number of observations have shown, the systems which provide the visuo-spatial organisation of the graphic image (which underlies the grapheme) are the parietal-occipital sections of the brain.

Destruction of the parieto-occipital and temporo-occipital zones of the left hemisphere eliminates essential prerequisites necessary for writing and leads to clear-cut disturbances. However, these disturbances differ sharply in character from those which we described above.

In the presence of such damage the sound analysis which underlies the writing of a word is preserved and the patient continues to grasp exactly what it is that he must write. However, the process of translating a phoneme into a grapheme is badly disturbed and the patient begins to experience significant difficulties in the act of writing, not knowing how he must write one or another letter. In cases of damage of the parieto-occipital zones, information about the organisation of visual and visuo-motor experience is substantially damaged and the patient, knowing which letter he ought to write, is unable to preserve its correct spatial structure and therefore substitutes one spatial direction for another while writing and loses the correct spatial relation of elements of the letter or substitutes the needed image of the letter by its mirror image. In cases of temporo-occipital damage — as O.N. Kaufman (1947) has shown in our laboratory — disturbances of writing may have a deeper nature and the patient is often unable to remember which grapheme relates to which sound and substitutes letters according to their optical similitary and sometimes completely correctly pronounces the necessary sound but writes it with some completely inadequate letter.

It is easy to see that the disturbance of the process of writing

occurs here in a way which differs sharply from the forms described above.

We will not mention a series of specific types of disturbances of writing which are evoked by damage to the central zones of the premotor area ("centre of Exner"), by damage to the frontal lobes or by deep intracerebral tumors of the anterior parts of the left hemisphere, which change normal relations between the cortex and sub-cortical motor nuclei.

Each of these types of damage which disturbs the motor organisation of writing or its relation to initial intentions, evokes completely specific defects of writing demanding their own special analysis.

The facts which we here introduced allow us to come to an indisputable position. It was in order to show this that we allowed ourselves to be so discursive.

Disturbance of writing may be evoked when there is damage located in *various parts of the brain.* However, it would be incorrect to think that these centres of damage do not have local significance. The symptom of the disturbance of writing has multiple significance, as do all other symptoms, though it *may be used for local diagnosis of brain lesion.* In order to accomplish this, the disturbance of writing must be submitted to *neuropsychological analysis* which allows us to *establish the essential qualities of the symptom and to find those factors which underlie it.* Only such analysis allows us not to evaluate it as a symptom of a general brain disturbance and to use it for local diagnosis.

* * *

We have examined a single example which showed that it is impossible to relate a function to some limited part of the brain cortex or to conclude that its disturbance *directly* indicates circumscribed local lesion.

Any, especially higher (mental) function is a *functional system* based on the combined work of a dynamic structure of cortical zones working together. But it is especially significant that *each of these zones contributes its own factor to the making of a functional system;* destruction of each of these parts, removing that factor, leads to the disintegration of the whole functional system.

However, each time *this functional system suffers in a special way.* Close study of the *structure of the symptom* permits us to evaluate

the factor which underlies the disturbance and to use the symptom for a local diagnosis of the brain damage.

From this it should be clear that *local damage of the brain cortex should not be related to a symptom* (which might be of multiple significance and might have been evoked by damage in various locations) *but to a factor which leads to the origination of a symptom.* This factor may be determined only when there has been careful psycho-physiological analysis. Such analysis or *"qualification of the syndrome" is a necessary link for the use of disturbances of higher psychic functions for the local diagnosis.*

We attempted to show this principle of analysis in the example of writing disturbances, but we might easily use as examples disturbances of gnosis, praxis, speech or intellectual processes, all of which manifest themselves in special ways when different parts of the brain are damaged.

This means that symptoms of disturbance of any higher cortical function may be used for local diagnosis of brain damage, but that such a diagnosis can be carried out only when there is qualitative analysis or *evaluation of the symptom.* Such *evaluation* of the symptom is the fundamental task of neuropsychology.

3.

Analysis of the symptom and selection of its underlying factors is only one side of neuropsychological investigation.

The suggestion that underlying the observed symptoms lies one or another factor (in the above examples: disturbance of phonemic hearing, the kinesthetic basis of articulation, visuo-spatial schemes, etc.) gives us a certain *probability* that the suggestion of corresponding local damage is true; however, it does not give complete *assurance* that this is so.

Such assurance is obtainable only if the basis of the assumed factor is found *in a series of other symptoms,* in other words, if a *whole syndrome* is established, all the aspects of which may be explained on the basis of a single, primary source.

Such a comparison of different symptoms and the discovery of a general factor underlying them is the second task of neuropsychology and may sometimes give us unexpected results.

The initial hypothesis in this line of work is the assumption that

in the presence of a given local lesion which directly causes the loss of some factor, *all functional systems which include this factor suffer, while, at the same time, all functional systems which do not include the disturbed factor are preserved.*

This principle, which H. L. Teuber (1959) called "the principle of double dissociation", has a basic significance for the *analysis of the syndrome* and allows us to increase our assurance about propositions concerning the local significance of a symptom.

We will illustrate this principle with a few examples.

It is well-known that destruction of the *left temporal lobe* (and especially its upper posterior sections) leads to the disturbance of phonemic hearing. This primary disturbance unavoidably leads to a series of secondary (systemic) disorders. As a result of this defect, the repetition of perceived speech, writing and naming subjects are disturbed and those intellectual operations which demand stable acoustic speech traces are also upset. However, this primary loss does not result in a deterioration of the process of orientation in space, preservation of visual images and written calculation, which are carried out without the participation of the acoustic analysis and for which the loss of this factor remains unimportant.

The opposite picture can be observed when the *occipito-parietal* sections of the brain are damaged. In such cases, the primary result of local damage is the disturbance of *spatial orientation* and the ability to preserve simultaneous spatial schemes. As a result of this primary disturbance, spatial orientation of movement suffers, spatial schemes of writing are disturbed, defects of counting and of the logical-grammatical schemes (which include this very same spatial factor) occur. But musical hearing, rhythmic-melodic structures and a series of functions which do not include the spatial factor remain intact.

Close study of a syndrome permits us in both cases to establish the indicated "double dissociation of symptoms" and, in a large measure, raises the probability of a correct local diagnosis of the damage.

Syndrome analysis carried out during neuropsychological investigation has still another, no less important theoretical side. It allows us to establish the *physiological difference between seemingly similar functions and the physiological similarities between seemingly different functions.* We will illustrate both with examples.

Phonemic and musical hearing (the ability to distinguish speech sounds and to retain musical melodies) may at first glance seem to be very similar functions which have common neurological bases.

However, as observations of cases of local brain lesions have shown, they are as a rule highly dissociated. Damage to the left temporal lobe, which leads to disturbance of phonemic hearing, may leave musical hearing untouched. The patient, unable to distinguish similar phonemes, will continue to retain the melodiousness of speech and may even sometimes successfully reproduce tunes. It is difficult for us to forget the case of one leading composer, Sh., who after a haemorrhage in the left temporal zone, showed a gross sensory aphasic syndrome, but who, although an aphasic, wrote a series of symphonies and other musical compositions. There are data which indicate that damage to the right temporal zone does not evoke any defects of phonemic hearing but may lead to amusia.

The dissociation of seemingly similar functions permits us to consider the significant differences in their neurological structure and to establish the existence of different brain mechanism in processes which seemed to be highly similar.

Another example shows what close neurological mechanisms seemingly quite different psychological processes may have.

At first glance, it might appear that there is nothing in common between orientation in space, numerical schemes and certain logical-grammatical operations. Nevertheless, the facts indicate that a significant number of local lesions of the left parietal (parieto-temporo-occipital) zone lead, not only to the disturbance of orientation in space, but also cause substantial disturbance of numerical schemes, operations of counting and the understanding of complex logical-grammatical constructions. Disturbance of the categorical structure of numbers, difficulties in counting by decimal system, inability to understand immediately such logical-grammatical constructions as "the circle under the cross", "spring before summer", "Olga is lighter than Kathy", or to distinguish the meaning of the construction "father's brother" and "brother's father" long ago became reliable symptoms of damage to this area of the brain cortex.

Detailed psychological analysis indicates that this coincidence of symptoms is far from accidental and is due to the fact that in all seemingly different psychological processes there is a general factor: organisation of elements into simultaneous spatially oriented schemes. Henry Head (1926) spoke of this factor when he talked of the difficulties in "placing details into a coherent whole" which are caused by such lesions. O. Pötzl (1928) also spoke of this factor when he pointed out that patients with lesions of the parieto-occipital system

lose the ability to translate a simultaneous review of certain materials into simultaneous schemes on necessary aspects of the material.

The discovery of *different* factors which underlie quasi *similar* functions and of *general* factors which unite seemingly *different* psychological processes is one of the important tasks of neuropsychology, whose theoretical significance is difficult to over-estimate.

We have presented those principles of neuropsychological analysis of the disturbance of higher mental functions which allow us to use these disturbances for the local diagnosis of brain lesions.

These principles, which spring from the conception of the systemic structure and dynamic localisation of higher mental functions, possess, we are sure, serious heuristic significance for local diagnosis of brain lesions. However, like all principles, in practice they encounter many difficulties which should be taken into account in their application.

Brain lesions ordinarily are of *regional* and not of narrowly limited character. A brain tumour ordinarily touches on a number of zones, complicated by regional edema and sometimes by additional factors which concern the brain as a whole. A haemorrhage generally spreads into several zones. A bullet wound of the brain is often accompanied by complications which deprive the lesion of its expected local character. All of this significantly complicates the conduct of neuropsychological investigation and often replaces exact local diagnosis *by regional diagnosis of the damage.*

No lesser complication arises from the fact that the structure of psychological functions at different stages of mental development and in different forms of mental activity may be far from identical. The process of writing, in beginning school children, is based on sound analysis to a much greater degree than in an adult, where these functions can be highly automatic. The process of recalling a series of words may occur by a direct path based on the visual image or mnemonic logical means may be used. This variability of means, with whose aid the patient may accomplish one or another task, greatly complicates neuropsychological analysis and permits us to consider the various dynamic localisations of one and the same form of psychological activity. It forces us to be careful when characterising one or another symptom.

Nevertheless, in the presence of all these complicating factors, analysis of the change in higher mental functions, due to local lesions

of the brain, can substantially enrich the possibilities for local diagnosis. Therefore, we believe that neuropsychology occupies an important place in the clinical analysis of local brain lesions.

Summary

A precise and early local diagnosis of a circumscribed brain injury is one of the most important problems of the neurological and neurosurgical clinic.

That problem can be solved only on the basis of an adequate neuropsychological theory and with the application of a series of special psychological methods.

Every psychological function can be regarded as a complicated functional system which is a result of a constellation of simultaneous and successive partecipations of several cortical zones. Each of these zones takes part in the realization of this functional system providing a highly specialised factor which is included in the course of psychological function. That is why lesions of every cortical zone can result in a disorganization of the functional system, but with different localisation of the primary lesion the type of the functional disturbances becomes different, according to the special factor, disturbed by the local lesion.

The paper gives several examples of the multiple significance of symptoms observed by neuropsychological analysis of local brain lesions and describes methods which can be used for their application for local diagnostics of the injury.

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