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TWO BASIC KINDS OF APHASIC DISORDERS

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2. The Problem.

Several decades ago de Saussure (1) and R. Jakobson (2,3) singled out two basic ~~components~~ principles of the organization of language and speech.

The first was the principle of a paradigmatic organization of ~~words~~ language elements. Verbal sounds were organized in a system of oppositions, words ~~meanings~~ – in a hierarchical system of meanings. This aspects is well known in Psychology after the classical studies of L.S. Vygotski. The second ~~was~~ principle was of another nature – syntagmatic. In fluent speech words are organized in a proposition or phrase. The noun is connected with a predicate, and in turn both with additional parts of a sentence. As it was shown by a series of ~~studies~~ modern psycholinguistic studies (4, 5, 6) the acquisition of speech is a rather complicated process, ~~and which is~~ based on a mastering of some „deep" ~~basic~~ syntactical structures, ~~serving~~ which serves as a base of linguistic „competence" and which is transformed into „superficial" linguistic structures, different in different languages. The later process is supposed to be a base for real linguistic „performance".

A problem arises: what is the psychological and psycho-physiological nature of these two basic components of speech? Are they realized by the same ~~neuro~~ cerebral mechanisms, or are they are based on different ~~brain~~ cortical systems in which ~~and~~ only ~~(a co-ordinated work)~~ coordination of both systems results in a normal process of speech.

Neither psychology, nor psycholinguistics can answer this question. That is why every observation of the kind of alteration of speech in local brain lesion can be of a ~~high~~ great value, and a Neuropsychological analysis of corresponding data can be

easily used to ~~acquire~~ find a definite answer to this basic problem. Thus a new branch of science arises – Neurolinguistics arises (7, 8, 9, 10)

Basic data ~~of~~ for this new branch of science come from a careful description of the principal ~~kinds~~ rules of the disturbances of speech in local brain lesions and of the ~~the~~ factors and forms of aphasia which can be observed.

We shall summarize briefly these data which were described in ~~our~~ a series of other publications (7, 11, 12)

2. Basic Functional Systems of the Cortex

If we ignore the deep structures of the brain, which are of ~~a principal~~ major importance for ~~the~~ preservation of the active states (13, 14), we ~~can~~ have to recognize and distinguish two principal parts of the cortex, each having its special role in the realization of behavioral systems.

The first includes posterior (temporo-parieto-occipital) parts of the cortex, and it serves for the input, processing and preservation of ~~the~~ information which comes from the external world. These zones of the cortex ~~we~~ are well known as the gnostic zones.

The second includes anterior (premotor and frontal) ~~zones~~ ~~of~~ cortical areas; they ~~have~~ play a decisive role in construction of decisions, plans and programs and in the process of ~~the~~ comparison of the effect of action with the preliminary decision. We can call them dynamic cortical zones.

Both ~~the~~ parts of the cortex ~~have different~~ differ in morphological structure (15) and ~~a~~ have different ~~the~~ relation to modality-specific processes (11, 14).

The posterior parts of the cortex ~~have a~~ include typical histological strata, and in the primary (or extrinsic) parts of these zones there is a predominance of the fourth, receptive layer, whereas more complex & secondary and tertiary (or intrinsic) parts of these zones have ~~another~~ A DIFFERENT structure ~~and~~ with a clear predominance of the second and third (associative) layers of neurons. (15) ~~is text~~. That is why it was supposed that these intrinsic areas serve as an apparatus of processing information and provide a complex ~~&~~ function of synthesizing of separate ~~inf~~ units of information ~~& which is~~ received. That is the basis of the hierarchical principle of the functional organization of ~~the~~ these zones, and this principle is preserved in the activity of every modality-specific part of the posterior zones of the cortex. It is clear that this function of ~~simultaneo~~ converting of successive information in „simultaneous ~~system~~ systems" is of ~~a~~ basic importance for the realization of the ~~&~~ most complex hierarchical or paradygmatic ~~organ codes~~ organization of the information received. (11, 14, 16)

The Anterior parts of the cortex have a basically different functional organization

The morphological structure of these parts of the cortex ~~has~~ has a vertical ~~organ~~ organization ~~type~~ which is typical for the motor cortex (15), ~~they have not~~ The cortex here is not sensory-modality specific. The hierarchical principle of the functional organization we mentioned is preserved ~~it~~ in these zones too. Primary (extrinsic) parts of these zones have a predominant fifth layer (motor layer of the ~~cortical cells~~ neurones); the secondary and tertiary (intrinsic) parts have ~~the~~ predominance of the second and third layers, which ~~have~~ are not somato-topically specific, ~~and~~ The more complex areas of ~~this~~ the anterior zones of the cortex (the ~~prefronta~~ ~~as~~ granular ~~fr~~ prefrontal part) ~~has~~ plays a decisive role in the ~~most complicated~~ retention of the most complex successive ~~Ted~~ plans and programs of ~~human~~ conscious activity (11, 14, 17, 18).

We have only to add that in man both hemispheres (+ the

major and the minor one) are not equivalent. The left (major) hemisphere has an immediate relation to the organization of the activity of the leading hand and of the speech process, whereas the right hemisphere is not connected with the speech processes and the verbal organization of ~~behavior~~ conscious actions, and it plays a ~~has a some~~ different role in the organization of behavioral processes (19, 20).

With these basic principles in mind we shall discuss the role ~~both~~ ANTERIOR and posterior parts of the cortex play in „paradigmatic" and „syntagmatic" organization of verbal behavior.

3. Disturbances of „paradygmatic" organization of speech with lesions of the posterior parts of the „speech areas".

The posterior parts of the ~~cortex~~ major hemisphere (which are the essential apparatus for receiving, processing and storing of information), ~~and especially these parts of the m~~ play a decisive role in the coding of the information in ~~paradig~~ paradigmatic systems.

It is well known that ~~the~~ verbal sounds are included in a clearcut paradigmatic system of phonemes while the morphological and semantic units (words and word meaning) are coded in paradigmatic systems of images and concepts. To find a proper ~~word~~ sound the subject has to select the needed phoneme, and he must block all other phonematic alternatives; to find a proper word he has to make a similar choice on the morphological and semantic level, selecting the word needed and blocking all unsignificant connections which the image and meaning of the word can evoke.

This process of ~~choice~~ selection of the proper ~~word~~ ~~sound~~ phonematic or semantic system (or of the „decision making") does not require significant efforts in a normal person. The process of selection is here highly automatized. The ~~so~~ phonemes or words the subject needs become ~~autom~~ automatically dominant and all alternatives the subject does not need at the moment are blocked very easily.

The situation changes significantly in the pathological states.

It is well known that the normal cortex ~~is functioning~~ functions according to the „rule of strength" formulated by I.P. Pavlov: strong (or significant) stimuli evoke strong responces whereas weak (or unsignificant) stimuli evoke weak responces (21). That makes the selective processes easy: significant traces become stable, and unsignificant traces are easily blocked.

~~All that~~ This changes ~~do~~ in pathological states when pathological or inhibitory phases (21, 22) take place. Here the normal ~~rule~~ „rule of strength" ~~suffers~~ is disturbed so that both strong and weak (or: significant and unsignificant) traces evoke equal reactions and an equalization of excitation of both ~~two~~ kinds of traces is seen. That is why the probability of evokation of different alternatives can be observed, and ~~the~~ ~~the process of~~ selectivity of different systems of traces ~~suff~~ is easily deranged.

It is ~~so obv~~ evident that these neurodynamic changes result in a deterioration of hierarchically organized systems and the preservation of complex „paradigmatic" structures of language traces is hindered.

If the pathological state is limited ~~by~~ to the left temporal parts of the cortex (or the ~~aco~~ verbal-acoustical areas) corresponding paradigmatical organization of speech sounds or phonemes ~~is~~ becomes fully ~~and~~ deranged. Different phonetic components (such as soundness, explosiveness etc.) are evoked with equal probability and the whole phonematic code is broken down. If the ~~process~~ pathological state is less extensive, ~~expressed not as severe as it was in mentioned, and~~ only correlated (or opposite) phonemes (the patient becomes unable to discriminate) (such as ~~b/d~~ „b" and „p", „d" and „t" etc). These ~~be~~ disturbances evoke a breakdown of a paradigmatically organized phonematic system, and a syndrome of „acoustic aphasia" is observed. We have described this syndrome elsewhere (7, 11 et al. etc.)

It is easily seen that such ~~kind of~~ disorganisation can be evaluated as a special type of „paradigmatic" disturbance - which is limited by ~~an~~ the verbal-acoustic sphere.

If the pathological state is limited by the lower part of the left post-central (kinesthetic) zone of the cortex ~~the~~ similar disturbances are seen in the ~~artic~~ selective organization of the articulatory processes. Patients of this group become unable to discriminate correlated (or opposite) articulames, such as labial „m", „b" ~~and~~ „p" or palato-lingual „l", „n", and „d". The proper choice between those alternatives becomes difficult and „paradigmatic" ~~order~~ organization of the articulatory system suffers. We have described this syndrome as „afferent motor aphasia" (~~#~~ 7, 11 et al.) and we shall not discuss it further.

Of ~~the most~~ utmost interest ~~are~~ is the ~~deterioro~~ functional disorganization of language processes observed in cases when tertiary temporo-parieto-occipital cortical zones of the left hemisphere. The pathological state ~~is limi~~ includes In these cases both the ~~system of a~~ „paradigmatic" organization of phonematic and articulatory systems can be to a certain limit preserved, but the ~~the~~ process of an „equalization of excitability" (23) can ~~inde~~ result in a disorganization of the semantic system. Different semantic connections of ~~a w~~ the word as a multimodal matrix ~~of semantic can~~ become equally excitable and all semantic alternatives are evoked with equal probability. That is why patients of this group start to produce a series of paraphasias. In trying to find the word „spectacles". They can say „glasses", „eyes", „frames" etc., and patients who try to find the word „maple" can evoke with an equal probability such words as „beach", „pine", „forest", „tree", „garden" etc.

It is easy to see that „paradigmatic" organization of the semantic field ~~becomes~~ severely disturbed, and similarities

by situation („maple" – „garden"), or by generalization („maple" – „tree") or even by morphological structure („book-shelf" – „card-board" or „micro-scope" – „micro-tone" or „tele-phone" – „tele-visor") can replace the highly selective organization of normal word-finding. ~~These kind~~ Symptoms of paraphasia as well as the „tip of tongue phenomena" are well-known (24, 25, 26, 27)) and ~~we shall~~ to spare time we shall not discuss them further.

Of paramount significance is the fact that even a severe derangement of the „paradigmatic system" of language does not involve any primary disturbance of the second or syntagmatic system. Speech processes in these patients preserve their fluent character with their intonational, prosodic organization remain undisturbed. That is why this group of patients who have severly disturbed phonemes or articulemes and who show a marked deterioration of semantic organization of words and their relations preserve their fluent syntagmatically organized speech. ~~Their~~ Syntactical structures can be secondary disturbed, but the basic relations of noun and predicate remain undisturbed. Such patients who become unable to find proper words and to ~~articulate prop~~ distinguish or to articulate proper sounds, but preserve the basic ability to express their thought by means of partially destroyed codes, using the preserved intonational units. That is why patients with temporal (acoustic aphasia) can utter long sentences which are disrupted in their phonetic, morphological and semantic elements but which are preserved in their prosodical structure. ~~That is why~~ Therefore their utterances can ~~remain~~ be easily understood although ~~they can~~ their nominal contents can be close to zero.

The same can be seen in cases of semantic aphasia. Paradigmatic organization of word meanings and logico grammatical relations can be severely disturbed, but fluent speech with clear prosodic organization remains preserved and only ~~troubles~~ difficulty in finding proper words and in grasping logical relations hinders the speech of these patients

It has to be mentioned that similar relations can be found in receptive speech of the patients mentioned.

Patients with acoustic (temporal) aphasia lose the normal understanding of word meaning, but they preserve the understanding of the intonational units of fluent speech. Patients with semantic (parietal) aphasia lose the understanding of complex logico grammatical relations (7, 11) and, even after decades of training, remain unable to understand the meaning of such constructions as „father's brother" or „brother's father", (28) although the understanding of simple propositions and their prosodic organization remains undisturbed. A remarkable dissociation of disturbed understanding of „paradigmatically" organized „communications of relations" and well-preserved „communications of events" (29) is only one of the examples of the basic dissociation of disturbed „paradigmatic" and preserved „syntagmatic" organization of language systems in these patients.

We can only conclude how correct was R. Jakobson (2*, 3) who was the first scholar to mention this basic dissociation in aphasics.

4. Disturbances of „syntagmatic" organization of speech with lesions of the anterior parts of the „speech areas"

We described some basic features of disturbances of speech associated with lesions of the posterior zones of the left hemisphere.

A contrasting syndrome is seen in cases where the lesion is situated in the anterior parts of the „speech areas" of the cortex.

As we have already mentioned, morpho-physiological organization of the anterior parts of the cortex is closely related to its motor functions. It provides a serial organization of movements and of programmed action which are realized according basic intentions and plans. That is why derangements of the secondary (premotor) zones result in deterioration in fluent transition from one motor link to another, thereby disturbing motor skills and kinetic melodies. (11, 16)

~~Analog~~ Similar defects can be seen in deteriorations of speech processes associated with lesions of these zones.
As a rule, hierarchical structure of ~~code~~ linguistic codes or a „paradigmatic" organization of language remains in these cases preserved. Patients with lesions of the anterior parts of the „speech areas" preserve the phonematic organization of verbal sounds, and they don't confuse phonemes. They remain able to name objects shown and only rarely give some paraphasic mistakes which show ~~an~~ a confusion between different semantic alternatives. ~~wh~~ They have no ~~primarely~~ primary difficulties in understanding logical-grammatical structures, although such difficulties may appear secondarily, ~~which can be deteriorated~~ only secondary.

All these data show that ~~no ... basic defects~~ cases are not primarily disturbed in these ~~„paradigmatic" systems are observed. primarely undisturbed.~~ remain

A different complex of deterioration appear in these cases with ~~in~~ a „Syntagmatic" disorganization of speech processes.

As we already mentioned fluent speech remains practically preserved in patients with lesions of the posterior parts of the speech areas. They are able to ~~come~~ proceed from the basic intention to ~~the~~ propositionising and have no significant difficulties in transition from a noun to the predicate. ~~The~~ Prosodic, intonational organization of their speech remains intact, and some grammatical defects (known as „paragrammatisms) can be treated as secondary results of a „paradigmatic" ~~disturb imp~~ disturbances of language.

Opposite symptoms can be seen in „motor" or „dynamic" aphasias associated with lesions of the anterior parts of the „speech areas".

As a rule patients of this group preserve their ability to name objects and to understand meanings of words. Severe disturbances are seen in these patients in their fluent syntactical organization of speech. Transition from noun to predicate is here severely disturbed, and, while nouns remain preserved, as a rule, ~~preserved~~, these patients are practically unable to construct even the simplest propositions which require a transition from a ~~re~~ designation of an object to

a verb. They show ~~difficult~~ disturbances even in ~~transition from a noun to a p~~ the simplest forms of „propositionizing", and are often unable ~~even~~ to say „the dog barks", saying: „a dog ... and ... how is it?... a dog... yes.. and... how?". Often they replace a verb by a second noun, and trying to say „the house is burning" they say: „the house.. and.. fire.."

It is obvious in these patients that fluent, syntagmatically organized speech is broken down ~~in these patients~~, prosodic and intonational components of speech are severely impaired, and, in several cases, a monotonous, disrupted „telegraphic style" is observed. That is why speech processes in these patients are opposite to the speech processes in temporal aphasias. Thus, ~~and~~ ~~while~~ patients with temporal (acoustic) aphasia omit all ~~noun~~ nouns, telling the history of their disease as: „it was very bad.. couldn't speak.. and all.. was so difficult... and now it's a little better.." ~~– patients with moto~~ (all with a well preserved melodic organization). In contrast, patients with motor aphasia tell the same story with nouns preserved but verbs omitted: „Yes... speech... no speech... and the right hand... and doctor... and reading... writing..." etc.

The phenomena of severe impairement of the ~~syntactical orga~~ „syntagmatic" organization of speech is really only a special case of a breakdown of „kinetic melodies" or „serial organization of the processes" (30). The loss of this basic form of speech organization (2, 3) or a disturbance of the ~~The disturbances of the "fluent speech"~~ (31, 32, 33, 34) ~~are~~ became in the last decades one of the most discussed problems of speech disorders.

Disorders of the „syntagmatic" organization of speech can have different forms. For example, ~~and~~ whereas in one group of cases of „dynamic aphasias" (7, 11) a simple transition from the noun to the verb becomes severely deranged and the „linear scheme of the ~~phrase~~ sentence" is broken down (so that a simple external aid – such as a group of marks each designating a word is enough for a restitution of a phrase (35)). – In another group the ~~grammatical~~ construction of a proposition is disturbed in its grammatical forms and a real „telegraphic style" can

be easily observed ~~(35)~~ (7 et al.)

~~The essence of the~~ Disturbances of the „syntagmatic" organisation of speech processes can be observed not only in expressive speech, but in the understanding of linguistic structures as well.

Observations show that patients with ~~serious~~ impairments of the „syntagmatic" organization of fluent speech, associated with lesions of the anterior parts of the „speech areas", do not show marked breakdown of the understanding of complex logico grammatical relations. They can ~~easily~~ tell which ~~constructio~~ of the ~~both~~ two constructions „~~the~~ an elephant is bigger than a fly" or „a fly is bigger than an elephant" (is correct) and they can easily correct the mistake done by the experimenter. No ~~troubles equal~~ disturbances comparable to those observed in patients with „semantic aphasia" are seen here.

But if ~~the patient is~~ a phrase with „syntagmatical" mistakes ~~is presented and it~~ in ~~the~~ fluent speech is presented and the patient is asked to ~~tell~~ find the mistake in a sentence – for example, „Parokhod idet po vodoi" or ~~„The dog had b~~ „Sobaka ukussil malchika"[1]), – the patient becomes unable to identify this kind of ~~not~~ syntagmatical ~~mistake~~ error. We shall discuss these data in a special paper and shall not dwell on them here. (36)

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We have described two ~~basic~~ principal kinds of aphasic disorders of speech, ~~means that~~ in a full agreement with the ~~par~~ basic concepts proposed by R. Jakobson ~~(2)~~. (2,3)

We ~~don't~~ do not yet know in detail the psychological features and physiological mechanisms underlying these impairments, and we can mention only ~~so~~ their association with two basic parts of the „speech areas" of the cortex.

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1) „The boat is moving on the water" and „the dog has beaten the boy": in Russian the meaning of the whole sentence is ~~accom~~ realized by a series of flexions which ~~don't ex~~ are purely syntagmatical means and which don't exist in English.

Observation show that lesions of the anterior parts of the „speech ~~zones~~ areas" do not result in marked deterioration of the „paradigmatic" organization of language but lead to severe impairement of the „syntagmatic" organization of ~~the~~ speech processes. Observations show as well that lesions of the posterior parts of the „speech areas" ~~don't~~ do not severely disturb fluent speech and it's ~~the~~ „syntagmatic" organization but lead to a breakdown of different components of ~~the~~ „paradigmatic" organization of language – its phonetic, articulatory or semantic structures.

It is obvious that these ~~fa~~ data are only at the ~~a~~ very beginning of a neurolinguistic analysis of ~~spe~~ disorders of ~~spe~~ language and speech associated with local brain lesions ~~,~~ and that further observation will ~~make~~ enrich these statements. ~~But~~ Nevertheless, it is clear that „paradigmatic" and „syntagmatic" organization of verbal processes require different mechanisms and that ~~a~~ a careful discrimination of ~~both sides of the~~ these two mechanisms of speech is ~~of an utmost~~ necessary importance for a scientific approach to aphasic disorders.

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