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Towards the mechanism of naming disturbance,
in local brain lesions

—
(The syndrome of "amnestic aphasia")

—
In memory of R.C. Oldfield.

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Towards the mechanisms of naming disturbances
in local brain lesions

(The Syndrome of Amnesic Aphasia)

In a series of articles the outstanding ~~near~~ psychologist R.C. Oldfield, to whom we pay respect in this issue, discussed a most important question of the mechanisms of object naming and its disturbances in cases of the local brain lesions.

It is just this problem we shall try to analyse in this contribution.

During many decades the theory of amnesic aphasia remained one of the most obscure chapters of Neurology.

The classics of Neurological science ~~started~~ ^{departed}, as a rule from an associationistic approach to the word - the basic elements of language. They supposed the word being an immediate association between a certain complex of sounds and the image of the object and they understood the process of naming as a simple ~~re-activation~~ ^{evocation} memorization of this word association. According to this idea "amnesic aphasia" was considered as a special disturbance of memory traces.

Nothing can be more inadequate as such simplified conception of the word and as such understanding of amnesic aphasia. That is why both concepts have to be fundamentally revised.

We shall try to make such revision in this paper.

1. The naming process and its psychophysiological mechanisms.

~~The psychological structure of the word~~

The modern psycholinguistics knows that the word has two basic components. It designates a certain object (having an immediate significative function), and it includes this object in a system of connections, analyzing ~~the~~ its basic properties, relating the object to a certain category; the last process ~~gives~~ constitutes its meaning (1)

That is why ~~the~~ ^{naming of} ~~name~~ an object requires a complex psychological task.

Two groups of processes are required to name an object.

Firstly the subject has to single out some ~~each~~ basic, important properties of the object he is naming. To do that he has to preserve a well structured optical (or practical) image of the object and a well structured acoustic structure of the ~~or~~ verbal symbol he uses. If both conditions are deranged - no naming can take place.

~~Second~~ The second condition is connected with the complex semantic structure of the word.

As we already mentioned - the word is a ~~so~~ nucleus of a complex system ^(of semantic connections) ~~or~~ ~~the~~ ~~or~~ it includes the ~~or~~ a multivariate matrix. So the word "ink" analyses the object as something dealing with ink and something which stands; it ~~evidently~~ it can evoke a whole category of related objects ~~or~~ a whole concrete ~~thing~~ =

situation (desk, pen, paper, school etc.) ; ~~(it relates the word in a certain morphological class of words with a double)~~ it can evoke a series of words with similar double-component morphological structure or even words which are phonetically close to the word in question.

To find ~~a the prop~~ that is why to find the proper name one has to make a choice between this multivariate connections ; often in this respect naming is very close to the process of decision making.

In cases of simple and ~~well accustomed~~ ^{frequent} names this choice is made very easily ; in cases of unfrequent, ~~and~~ ^{rare} names it requires a complicated task ; ~~a series of alternatives~~ ^{alternative words of different dimensions} are evoked, and the decisive selecting of the word required can become very difficult. Such cases were carefully studied during the last few years and the "tip-of-tongue" phenomenon which can be observed is carefully described (2).

In normal conditions the process of choice does not evoke considerable difficulties : the selectivity of mental processes ~~is~~ ~~is~~ ~~is~~ makes the word needed most accessible ; a strong dominance of the connection needed is observed and the probability of the adequate ~~choice~~ decision becomes very high.

~~The~~ The neurodynamic basis of such selectivity of the psychological processes is well studied. As it was shown by Pavlov and his school ~~the flow of the nervous processes in a normal brain cortex~~ ~~is~~ ~~is~~ ~~is~~ are organized according some basic rules of neurodynamics. We have to mention only two of these rules : the rule of force and the rule of plasticity.

According to the first rule strong or significant stimuli evoke ^{in a normal cortex} strong ~~excitation~~ responses, whereas weak or insignificant stimuli only ^{excitation} weak responses. According the second rule every pattern of excitation can be easily replaced by another one ; this makes nervous processes fluent and provides an easily shift from one excitation to another.

Both rules we mentioned provide necessary condition for selecting the significant traces, to block insignificant or extraneous connections and to overcome the ~~influence of the influence of former~~ ~~the~~ ~~traces~~ influence of the former traces, otherwise - all condition necessary for making a choice of the proper connections.

All these conditions are severely altered in pathological states of the brain.

As it was ~~described~~ shown by Pavlov school - in so called inhibitory states of the cortex (as in pathological states as well) strong (or important) stimuli begin to evoke the same reactions as the weak (or unimportant ones) - and a certain equalization of excitability of cortical traces is observed. When the ~~inhibitory~~ inhibitory state increases even a more altered - "paradoxical state" can be seen ~~note~~ : strong stimuli evoke even weaker ~~and~~ reactions than ~~weak~~ the weak ones and old and insignificant traces and connections begin to dominate

over the new and important ones. (1)

It is obvious that in such ~~path~~ "inhibitory" or pathological states of the cortex every selectivity of ~~cortical~~ psychological processes is severely deranged, and the process of ~~select~~ highly organized, selective choice (which is required for every naming of an object) becomes impossible. (3)

~~Thus~~ Some similar changes can be seen in the plasticity of the nervous processes in pathological states of the cortex. Here a certain irradiation of the neurodynamic excitatory processes takes place, traces become pathologically inert and a quick shifting from one trace (or connection) to another is severely altered. It is obvious that this change of plasticity and this pathological inertia ~~may~~ results in a marked disturbances of selective processes we mentioned, ~~and that brings~~ inert stereotypes, which cannot be easily ~~break~~ blocked are observed and that makes the selectivity of choice between many alternatives even less possible. (4)

~~The most~~ Of a highest importance is the fact that these pathological states of the cortex can be ^{of a} general as well as of a partial or regional ~~type~~. The last takes place in local lesions of the brain (tremors, brain wounds, vascular disorders), - and that is why a certain loss of selectivity of psychological processes can sometimes have a partial form, and is observed only in some special systems.

That signifies that disturbances of selectivity underlying the process of choice (~~is each time in different localisation of lesions different~~) can be in differently localized lesions of a different type, and that we can ~~expect to observe~~ different structures of the process of naming, i.e. different types of amnesic aphasia in different lesions of the brain.

2. Basic types of "amnesic aphasia"

There are different ~~types~~ mechanisms underlying the disturbances of the processes of naming in different brain lesions.

At least two basic groups of such disturbances can be distinguished. In the first group some deterioration of the selectivity of ~~nervous processes~~ is, sensory-motor processes is seen, and a deterioration of naming in the input or in the output of the whole system can be observed. In the second group the disturbances of selectivity ~~have a~~ are of a higher, "central" type and the choice of the proper meaning of the word becomes deteriorated.

Let us discuss ~~the~~ these basic groups separately.
It was at the very beginning of Aphasia studies when Wernicke (5) and
after that - Marie and Foix (6) supposed that naming disturbances
are only ~~results of some decay of sight symptoms of some~~
results of some disturbances of sensory traces (or images) of the words.
This idea was certainly ~~not~~ adequate for some forms of ~~the~~ naming dis-
turbances in ~~some~~ cases of so-called sensory (or acoustico-gnostic)
aphasia. Further investigation (7, 8, 9) showed that even these distur-
bances have a much more complicated structure, and that the ~~the~~
mechanisms underlying these defects cannot be seen in a simple
"trace decay", but are rather associated ~~not~~ with some basic disor-
ders of the phonemic organization of the acoustic processes, and
a certain loss of selectivity in oppositions of correlated phonemes
and some destructions of organized systems of ~~some~~ verbal
sounds results in these cases in ~~the~~ the phenomenon of "alienation
of the word meaning of the words", which is an essential symptom
of the sensory aphasia. It is obvious that patients of this group
become unable to find ~~the~~ adequate words to name an object, and
that ~~at a whole net of disorganized sounds~~ to select the proper
groups of ~~some~~ phonemes from a disorganized net of sounds. That
is why ~~the~~ the evocation of different sound alternatives becomes
equally probable, and that ~~is~~ can be easily seen in a series
of "literal paraphasias" observed in these patients. It is obvious
that every attempt to help the patient to find the proper word
by prompting ~~him~~ (giving him the first part of the word) does not
bring any results, - and that is one of the most important features of
this kind of ~~the~~ "amnesic aphasia" (10, 11)

It can be easily seen that in these patients "amnesic aphasia" is not
a separate, special syndrome, but only a symptom included in a
much more complex syndrome of "acoustico-gnostic" ~~the~~ speech
disturbances.

The second ~~sub-~~ form of naming disturbances included in the first
group are disturbances of naming which ~~are typical of~~ appear in
cases of so-called "afferent (kinesthetic) motor aphasia" (7, 8, 9),
which can be seen in lesions of the post-central part of the "speech
area" (7, 8, 9). ~~the~~

In these cases discriminating acoustic discrimination of phonemes is ~~not~~
served, but the output of speech - the choice of proper articu-
lation ~~is~~ can be highly damaged. Such "opposite" articulations as
b-m, d-l can be confused, and finding of selective articulatory
articulation of words ~~can~~ becomes ~~is~~ highly difficult. A careful
study of ~~paraphasias~~ literal paraphasias in these patients can easily
show that ~~the~~ ~~loss of~~ a certain equalization of probable

articulatory alternatives result in severe disturbances of the processes of naming. It is obvious that this type of naming disorders is ~~not~~ cannot be evaluated as a pure form of "amnesic aphasia"; it ~~has~~ is a result of different mechanisms and it is included in a much more complicated syndrome of ~~abstract~~ apraxic and motor aphasic disorders, which was called by the French authors the "phonematic disintegration of speech" (12, 13, 14).

The second ~~for~~ basic group of naming defects are ~~distinct~~ speech disturbances which ~~were~~ are well known as ^{a syndrome of} "primarily" or "pure" amnesic aphasia, and which was described by K. Goldstein (15, 16), K. Keat (17) et al.

In this group of patients with lesions of the tertiary, parieto-occipital ~~zones~~ of part of the speech areas - no sensory or motor speech defects are seen and the ~~input-output~~ (or operational) links of the speech system are preserved. The basic symptom ~~is~~ is here an inability to find proper words to name an object, and the patient tries actively to find it giving a great number of inadequate - mostly "verbal" paraphrasias. (18, 19, 20)

Two theories were proposed to explain this basic symptom.

One part of authors tried to understand this ^{it} defect as a partial loss of verbal memory; the second - as a disintegration of more complex intellectual defect - loss of abstract, categorial thought.

Both hypotheses are hardly acceptable.

Observation of the verbal behavior of these patients show that the issue of this symptoms is not a loss of word needed, but rather an inadequate amount of different words, partly - ~~similar~~ having a morphological similarity of the word which the patient tries to remember, partly ~~near~~ words ~~near~~ related to the same category, partly - words designating ^{different} some components of the whole situation associated with the object the patient tries to find. It means, that the basic defect is not so much a loss of the word but rather a struggle of a large amount of alternatives, and that the patient is unable to make an ~~adequate~~ choice of the word needed.

It has to be mentioned that some of the words which ~~come~~ are evoked during this ~~et~~ process of choice are of a ~~no~~ much more abstract type than the failing word and that the patient who is unable to find the ~~word~~ name of the nightingale can say: "oh... that is a bird... a flying animal..." + naming etc. That means that ~~no~~ ~~help~~ an assumption of a loss of "categorial thought" can ~~be~~ hardly explain this phenomenon

Careful studies have shown that at least two mechanisms underlie these "primary" naming defects can be mentioned, the first being of a gestural, the second of semantic type.

As it was shown by ~~our~~ L.S. Tsvetkova and her collaborators (21, 22) patients with lesions of ~~parieto-occipital~~ ^{the left} parieto-occipital areas of the cortex and ~~amnesia~~ naming disturbances show very often some slight defects in optical analysis and synthesis of the ~~object~~ images of the objects. Experiments show that they are very often unable to complete a drawing consisting of a scheme of the body and the head of an animal so the whole drawing will represent a rabbit or a cat, a cock or a duck. ~~Decisive elements~~ ^{essential} ~~elements~~ which discriminative features of the images are lost and ~~decisive~~ ^{essential} elements are mixed with secondary and insignificant. Another series of experiments has shown that patients of this group are very often unable to qualify schematic images and drawings and to decide whether the given scheme ~~is~~ represents an image of a cat or a rabbit (21)

These defects of visual analysis of an image can be regarded as a result of a pathological state of the secondary and tertiary parts of the visual zone resulting in an equalization of the significance

is of an importance to a well of separate features, which ~~is an essential~~ according to is an organized perception and which - according to modern views of psychology (25) is ~~as~~ of a great one of the basic mechanisms of visual decision-making (23). It is obvious that in cases when these process of equalization of a group of perceptual cues takes place - the process of evaluation of the object seflens and ~~the~~ the naming of the object becomes difficult because of the ~~loss of selectivity of percep~~ disorganization of its perceptual base.

The second - and the most important - mechanism underlying the naming defects is that of a ~~disorg~~ loss of selectivity in the semantic system - resulting from a pathological state of the tertiary ~~post~~ ^{posterior} ~~and~~ ~~anterior~~ zones of the left ~~post~~ ^{posterior} ~~temporo-parietal~~ ^{temporo-parietal} cortical ~~zone~~ ^{zone} areas.

As we already mentioned the basic defect ~~of~~ in patients with this type of amnesic aphasia is not a loss of words but an ~~it~~ ineffective struggle between many alternatives, which are evoked with equal probability. In trying to find the name of an inkstand these patients can say a morphologically similar word as "brief-case", or a word relating to the writing situation: "a pen... no... a paper..." or a word with a general meaning "this writing tool... This vessel..."; ~~the~~ very frequently the patient tries to use a different way and instead trying to find the word - ~~include~~ uses a whole sentence, saying.. well, I have to ~~use~~ use it for writing... when I write, I have to use... oh... This thing..." etc.

These kind of verbal paraphrasia show that different connections of the complex matrix of relations are evoked with equal probability, and we can suppose that the underlying physiological defect is a ~~pathological~~ equalization of all ~~the~~ kinds of traces typical for the pathological state of the tertiary zones of the posterior (parietal) parts of the cortex.

We have ~~to~~ now to make a last step and to mention a last form of naming disturbances which appears in lesions of the anterior parts of the speech zones of the cortex.

It is well known that ~~our~~ our language include two basically different components of relations. ~~One is~~ ~~the~~ The linguists call one the "paradigmatic" relations (including the word in a semantic code with a hierarchical structure), and the second - "syntagmatic" relations (fluent speech or "propositionizing" i.e. construction of sentences). ~~These two comp~~ (24).

Observation ~~is~~ show that these two components of speech are associated with different cortical mechanisms, and that lesions

of the posterior parts of speech zones of the cortex result in a disintegration of "paradigmatic" relations of the word whereas fluent syntagmatical constructions remain ^{relatively} ~~practically~~ undisturbed; ~~whereas~~ the reverse is seen in lesions ~~with~~ of anterior parts of the speech zones, when massive disturbances of fluent, "syntagmatic" speech can be seen and when ~~the~~ the speech of the subject shows symptoms of so-called "telegraphic style", whereas "paradigmatic" ~~relations~~ constructions ~~a~~ remain relatively undisturbed. (7, 25)

That is why a very different type of naming defects can be seen in patients with lesions of anterior parts of the speech zones. ~~This is~~ These patients have no trouble in naming an object; ~~the fact~~ a direct naming of an object; but in contradistinction to the patients with lesions of the parieto-occipital zones of the cortex and the syndrome of a "pure amnesic aphasia" they show ~~very~~ very expressed difficulties in finding words ~~being~~ included in a fluent speech. ~~That is why~~ That very important symptoms of severe disturbances in finding proper words included in a fluent syntactical construction with a normal ability to name isolated object ~~has~~ is a result of a different physiological mechanism. We do not know much about ~~such~~ this mechanism and we only can suppose that this defect is related to disturbance of predicative function of the inner speech which results in a ~~distinct~~ disorganization of some basic ~~of~~ processes of the generative grammar, loss of the "linear scheme of the phrase" etc. (26). Only further careful work can make this preliminary assumption clearer.

~~The general goal of this short communication~~

Our short communication has only one purpose: we wanted to show that the process of naming ~~is in no case a simple one~~, has a very complex psychological structure and that the defects of naming associated with so-called "amnesic aphasia" can have a different ~~the~~ nature, due to different underlying mechanisms.

We can only hope that further studies will bring our science to a better understanding of these mechanisms, and that the Neuropsychology of naming defects has to solve a series of important problems of the structure and the mechanisms of the symptoms of "amnesic aphasia".