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FACTORS and FORMS of APHASIA

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It is well known - especially in this country - that APHASIA is a very complicated form of DISTURBANCES of SYMBOLIC FORMULATION and EXPRESSION, -

but I can only totally agree with LORD BRAIN, that this disturbance has to undergoe a ~~thorough~~ detailed physiological analysis, -

and the well known syndromes of SENSORY or MOTOR, semantic or DYNAMIC APHASIAS - will be better understood after such a careful psycho-physiological study

to include, afferentation in the field of neurology

I shall do my best in following this line, which started some 30 years ago - and shall try to describe some data - which perhaps could serve as an addition to ~~elaborations done~~ the studies of Aphasia done in this country

I shall begin with so called Sensory aphasia and move along the other forms I mentioned.

with the anterior parts of the speech area of the cortex (Blinkov ⊗), - and its ~~disturbances~~ lesions result in a marked disturbances of the most complicated forms of acoustic analysis, and in the first line - in ~~phonem~~ discrimination of phonemes.

(a) Acoust.-Gnost

As we have seen in many patients with gun-shot lesions and tumors of the left temporal lobe (T1)

- the acuity of hearing can remain undisturbed,
- ~~but~~ the discrimination of complex non verbal sound-systems can suffer (discrimination of very short sounds or of sound series A-B-C-D vs A-C-D-B can be markedly disturbed)
- but the discrimination of SPEECH SOUNDS (PHONEMES) - is as a rule - severely impaired

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well, aphasia

1. ~~[illegible]~~ It is well known that ~~the~~ left temporal lobe (the Wernicke zone & their connected areas) are supposed to be the ~~an~~ important part of cortical end of the acoustic system - which Pavlov prefered to call „acoustic analyser".

Fig. 1

~~The [illegible] is well known~~ This ~~area~~ zone is very intimately connected with the anterior parts of the speech area of the cortex (BLINKOV ⊗) Fig. 1 - and its ~~disturbances~~ lesions result in a marked disturbances of the most complicated forms of acoustic analysis, and in the first line - in ~~phonem~~ discrimination of phonemes.

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- in severe injuries even disjunctive phonemes lose their distinctiveness, the subject is unable to single out some distinctive verbal sounds from a spoken word, and starts to perceive verbal sounds as noises

Fig. 2 — Fig. 2 - results of testing of discrimination of correlative phonemes in 800 patients with local brain lesion. (x)

(c) The loss of acoustic (& verbal acoustic) discrimination is a primary factor in lesions of the left temporal lobe (first of all in the lesions of T_1);
but - if this factor is disturbed - a series of secondary symptoms follow:
1) the subject is unable to perceive spoken speech - and loses the understanding of words (travel = trouble = drabble)
2) he becomes unable to name objects (and is unable to use some acoustic help)
3) he is unable to analyse the acoustic structure of the word and to write (making typical mistakes, Fig. 3 (x)) (although he can copy written words, sign etc.), etc.
4) he cannot retain traces of the spoken word, and his immediate acoustic memory is weakened

Fig. 3

(d) Acoust. mnest. If the upper parts of the left temporal zone are preserved, and the lesion is situated in a middle part of this zone (or in the white matter - as in many cases of otogenic abscesses)
- no massive disturbances of phonematic hearing can be observed - but the whole syndrome described becomes slighter.
- The patient can repeat isolated phonemes (although he mixes them in some series of similar words - ЗАБОР (fence) - ЗАМОР (lock) - ДОБОР (clarch))
- he is unable to repeat a series of words (although he can repeat series of movements or drawings)
- he cannot remember names for many (not to frequent) words - and any prompting doesn't help him
— and the SERIAL ORGANIZATION OF VERBAL PROCESSES becomes very disturbed.

That is a syndrom of a kind of ACOUSTIC-MNESTIC APHASIA, - and the unstability of the verbal acoustic traces are possibly the physiological factors underlying this syndrom

(e) Aphas. / music. NB One of the most interesting things is that prosodic & melodic components of speech can be preserved, - and I only can remember the case of one well known Russian composer, who suffered from sensory aphasia but was able to compose his best symphonies!

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So – the lesion of the left temporal lobe bring a loss of phonematic Hearing as a primary factor and a syndrome of sensory aphasia as a secondary, systemic result of this disturbance.

(2) Now – we can follow the same ers in analysis of the Motor Aphasia

(a) During a long time it was supposed that motor Aphasia is a single, unitary syndrome, that it follows a lesion of the Broca zone and that it is a result of the loss of the «motor schemes of words», or – if one wants to use a modern terminology – the encoding process

(b) This conception is doubtfull, – and a carefull study of the physiology of movement bring us to different conclusions

1) As it was found by several important Russian physiologists – Orbeli, Anokhin, Bernstein – efferent impulses themselves are not sufficient to provide exact, sophisticated movements

There are at least two different mechanisms, which can be responsible for a good motor ...

Kinesthetic

α/ An afferent - and first of all a Kynesthetic background of a movement, which can be regarded as the only mechanism giving the motor impulses a propper addres and in providing corrections of imulses ~~of~~ in the flow of the motor action (cf BERNSTEIN's, important studies of the PHYSIOLOG. STRUCT. of movements)

β/ An efferent - or a Kynetic mechanism, which provide ~~a~~ the arrest (or denervation) of the former link of the movement, a plastic transition ~~of~~ to the next ~~mot~~ link of the motor chain and as a result - a serial organized, skilled movement

(c) It was found - and that is very important for our approach to the ~~m~~ Forms of motor Aphasia - that both factors are connected with different ~~structures~~ beogrs of the Brain Cortex:

the Kynesthetic factor - with the post-central parts of the Brain

the Kynetic factor - with the pre-motor zones of the Cortex.

(d) That means that the ~~whole field of~~ motor aphasia can ~~be~~ result from at least two different factors, -

and that the whole field of motor aphasia has to be divided in at least two different syndromes -

α/ the syndrome of AFFERENT OR Kynesthetic MOTOR APHASIA, following post-central lesions

β/ the syndrome of EFFERENT OR Kynetic MOTOR APHASIA following lesions of the premotor system.

Let us examine them separately.

3

(e) Afferent (Kynesthetic) motor aphasia

So far I know - NISSL v. Meyendorff was among the first who thought motor aphasia can be a result not from the lesions of operculum Broca, - but that of operculum Rolandi - it is a result of a lesion of the afferent part of the sensori-motor area. [The 1st case of Broca himself proved this hypothesis]

Now we know that important deficit of the Kynesthetic basis of movement can be a result of post central lesions, - and that such lesion ~~can~~ ~~rea~~ (if situated in the lower part of this area) can result in a specific form of motor aphasia

α/ lesions of post-central area can bring a defect in the ~~[illegible]~~ addressing of the impulse to the propper group of muscles and result in a kind of afferent paresis - afferent cortical ataxia or afferent apraxia (as Dr Bay showed it elsewhere)

Fig. 4

The EMG study proves it (Fig. 4) (+)

The result of such deficit is a trouble in finding propper movements in a series of tests of "posturae praxis" (as V — V)

β/ If the lesion is situated in the lower parts of this region - the same disturbances are seen in the articulatory movements

- the subject becomes unable to find proper articulences and to differentiate such correlative OR SIMILAR articulemes as b-p-m or d-t-l ;
in ~~more expressed cases~~ massive lesions & severe cases this inability involves more discrete articulations; IN slight lesions - a similar disturbances can be found with special analysis
This disturbance of fine, sophisticated articulatory movements is supposed to be the PRIMARY FACTOR of Afferent (Kynesthetic) MOTOR APHASIA

γ/ as a secondary (systemic) ~~dis~~ disturbances which follow this factor - are:
- unability to ~~articu~~ find proper articulation of words,
- defects in ~~non~~ repetition of words & naming objects.
- sometimes disturbances in a loud reading (and even slight disturbances in understanding the ~~words~~ word read aloud)
- and typical disturbances in writing with characteristic mistakes (writing "instead" ete.) (Fig. 5) (×) Correction by visual analysis (×)

Fig. 5 & 6

But : a transition from single words to propositions, sentences - doesn't bring any specific troubles.

(f) Efferent (Kynetic) motor aphasia

A quite different kind of motor language disturbances is the syndrome of EFFERENT or KYNETIC MOTOR APHASIA, which is the result of lesions in the lower parts of the left pre-motor zone - or as it is called - the Broca's area.

α/ Lesions of the premotor zone don't result in any disturbances of Kynesthetic basis of movements ; these lesions are not accompanied by any loss of proper addressing of motor impulses, nor any symptoms of ataxia or postural apraxia.
The ~~m~~ most important primary defect in these cases is a loss of kynetic schemes or disturbance in skilled movements which is a result of a loss of the proper organisation of serial movements, the defect of denervation of the former line of a motor chain and the plastic transition to the next one

β/ If the lesion is situated in the upper parts of the premotor zone. (field 6a(β)) - we can see it in a ~~loss~~ disturbancy of ~~any~~ any skilled movement of the hand (a disautomatisation of tapping, rhytmical movements, kynetic melodies) / Fig. 7 / (×), sometimes - if the lesion is a deep one; ~~alterings~~ the normal connections of premotor cortex and ~~basal~~ subcortical motor ganglia) - in a series of perseverative ~~mov~~ symptoms occuring in movements, drawing, writing etc. (Fig. 8) (×)

Fig. 7

Fig. 8.

γ/ If the lesion destroys the lower part of the left pre motor zone (the Broca's area) - the same disturbances can be observed in Speech : the kynetic melodies of speech become disturbed, the transition from one articulation to another becomes impossible, - and although the subject can find proper articulation

for the first sound of the word – he is unable to change it for the next articulation (cf. moo-kha = moo... m... ma..)

It is easily seen that the encoding process is severely hindered by these deficit of kynetic sources, and these difficulties build the primary factor of the Efferent (or kynetic) motor aphasia

8/ The inability to name an object, to pass from the expression of one word to the next one, the loss of propositional speech as a kynetic unit – are the most significant secondary (or systemic) results of this kind of primary disorders, different in different stages of recovery, but relating to the same factor.

It is significant, that disturbances in writing in these patients have a very distinctive character: writing of separate letters can be preserved, but the proper order of letters in a word is often lost. The writing becomes a totally disautomatised process, position of letters change (Fig. 8) (x) and sometimes perseverations make a transition from one letter (or word) to another impossible (Fig. 9) (x)

Fig. 9
Fig. 10

9/ It is very important that severe impairment of contextual organisation of speech (R. Jacobson) can become a significant symptom in this form of aphasia being a result of the same loss of kynetic organisation of the phrase, and a the impairment of prosodic and melodic organisation of speech can sometimes go hand in hand with a severe deterioration of the scheme of the whole proposition, developing the form of the well known symptom of "Telegraphic Style" and a SPECIAL SYNDROME OF INABILITY OF AN ACTIVE PROPOSITIONAL SPEECH, which we called as "DYNAMIC APHASIA". All these symptoms have to be carefully studied, – and it is possible that we shall find some important mechanisms of these disorders in the impairment of the INNER SPEECH – which – after L.S. Vygotsky is a decisive mechanisme of the development of every verbal kynetic melody. It is obvious that the PHYSIOLOGICAL MECHANISMS of that very important form of APHASIC DISORDERS require a series of special studies.

4. Up to now we dealed with acoustic & articulatory of speech; but it is obvious that Language disorders can have a much more complex character bringing deterioration in semantic organisation of Language

In a broad sense that can be as a result of every severe im-pairment of the brain cortex, leading to what is called orga-nic dementia;

but we shall follow our way and try to find semantic defects in the narrow sense of the word as resulting from a factor associated with a definite locale lesion of the cortex

(x) The syndrome of semantic aphasia was well described by Henry Head in this country, – and we are unable to add much to this de-scription.

The important fact is that all symptoms of semantic aphasia can be

observed in cases of lesions of the left parietal - or temporo-occipito-parietal parts of the cortex, -

- and that they are closely associated with disorders of simultaneous and spatial schemes,

- with some inability to bring separate components in a coherent whole,

and to ANALYSE complex SPACIAL RELATIONS

This disturbance of spatial relations has a very specific pattern: not every space perception is disturbed in these case: it is firstly the perception of ASYMMETRICAL spacial schemes which is altered:

The patient is unable to distinguish right & left, fails in orientation in space, in analyses of the hands of a clock, position of fingers, spatial relations in geographical maps

It is very possible that this kind of a spacial synthesis requires a joint work of occipital (acoustic), temporal (vestibular) and retro-central (kynesthetic) zones with a synthesis of optical perception of the space + differential local signs from the right hand.

B/ It is very like that this disturbance of a synthesis of an asymmetrical space schemes is one of the very important factors underlying some very complex symptoms of SEMANTIC APHASIA.

A careful study has shown, that not all kinds of meanings are disturbed in these cases, but first of all - understanding of such relational schemes, which require a differentiation of asymmetrical space relations

I had to spend some years of linguistic studies to find such kinds of grammatical structures which require analysis of asymmetrical spatial relations and which are the latest products of the language development.

These are such types of constructions as „GENETIVUS attributivus" (Martha's brother vs. brothers father, or „dog's master vs. master's dog) /which followed the oldest forms „the father's his brother etc.), -

- prepositional constructions (the circle under the triangle vs the triangle under the circle, or „the spring is before the summer" vs. the summer is before spring") or

- or some more complex relational constructions (such as, Jenny is older than Mary, but younger that Jane"),

As a rule such kinds of grammatical structures are extremely difficult for the patients with parietal lesions BRING THEM IN

a state of confusion, —

- and even a long training ~~did~~ does not result in a simultaneous understanding of these structures

(and after a system of rehabilitative training patients can ~~never~~ come to the meaning of such a construction using a chain of long successive links of reasoning)

It is very important that the same deficit of simultaneous spatial schemes and of an analysis of assimmetrical spacial structures - result in these patients in marked disturbances of counting:

- every arythmetical process - especially with numbers organized in decimal system, and with transference of numbers in decimal system (31-7) -
  - requires an operation in such an assymmetrical quasi spacial field, —
  - and that is quite unpossible for this group of patients -
    - not because of ~~the~~ lack of abstraction, but because of ~~a~~ deficit of such spatial schemes

8/ It is a very hard task to find real physiological factors underlying this very complicated form of disturbances; a series of further experiments is needed (and some of them are now in progress in our laboratory)

- but it is clear that even ~~the~~ such complicated syndromes as SEMANTIC APHASIA had undergo a very sophisticated psycho-physiological analysis,
  - and that some important physiological factors ~~are~~ underlying these disturbances CAN BE found, — and will be found.

(5) We tried to describe ~~some~~ the most important forms of APHASIA and to find ~~factors~~ some factors which are basis for these forms.

We shall leave out from the present discussion very important problems of ~~#~~ another class of disturbances, — the DISTURBANCES of the regulating or controlling functions ~~and the selec~~ ~~THE STRUCTURE of the speech~~ These disturbances are ~~as~~ typical for a DIFFERENT CLASS of DISORDERS of Language & thought - which is ~~outside of~~ PROBLEMS of APHASIA ~~in the strict sense~~, — ~~a~~ They are important RESULTS of

FRONTAL LOBE LESIONS, and which was a subject of my special paper presented to the symposium on functions of the frontal associative cortex.

It is a special and most important part of the problem of Language disorders, and is worth of a special discussion.

6. I can conclude my presentation with a few final remarks:

The approach I presented is in no ways contradictory to the analysis of Levels of Language disorders started by Hughlings Jackson in this country a century ago.

It has as its special means - the analyse some important Factors underlying different Forms of Language Disorders, - and in that ways it can serve as an attempt to make some psychophysiological analysis of Language pathology and bring the problem of Aphasia in the general context of modern Neurology.