

Luria's neurolinguistics and contemporary aphasiology



**LURIAN APPROACH IN INTERNATIONAL PSYCHOLOGICAL SCIENCE
Yekaterinburg 13-16 October 2017**

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1. Introduction

Luria published two major books on brain organization of language and aphasia:

“**Traumatic Aphasia**”, initially published in Russian in 1947 and translated to English in 1970.

Almost 30 years later, and towards the end of his life he published “**Basic Problems of Neurolinguistics**” (Luria, 1976)

АКАДЕМИЯ НАУК СССР

А. Р. ЛУРИЯ

ТРАВМАТИЧЕСКАЯ
АФАЗИЯ

КЛИНИКА, СИМВОЛИКА
И ВОССТАВЛИТЕЛЬНАЯ
ТЕРАПИЯ



ИЗДАТЕЛЬСТВО НАУКА, МОСКВА, 1977

A.R. LURIA
TRAUMATIC
APHASIA
ITS SYNDROMES
PSYCHOLOGY AND
TREATMENT

MOUTON

DE GRUYTER

Alexander R. Luria
BASIC PROBLEMS OF
NEUROLINGUISTICS

JANUA LINGUARUM, SERIES MINOR

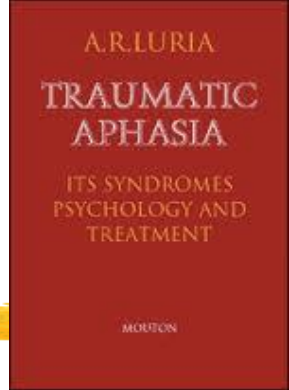


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1. Introduction
2. Brain organization of language: Initial proposal (Luria, 1947/1970)
3. Brain organization of language: Final proposal (Luria, 1976)
4. What has been Luria's fundamental contribution?

Initial proposal (Luria, 1947/1970)



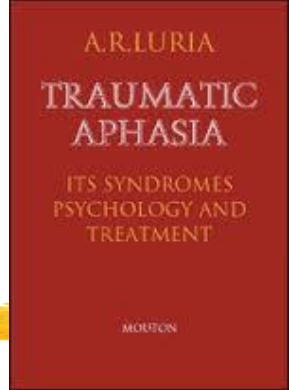
I shall refer to:

(a) his interpretation of aphasia

(b) Luria's classification of aphasia

(c) his attempt to establish clinical/anatomical correlations using the method of superimposing the lesion drawings.

Initial proposal (Luria, 1947/1970)

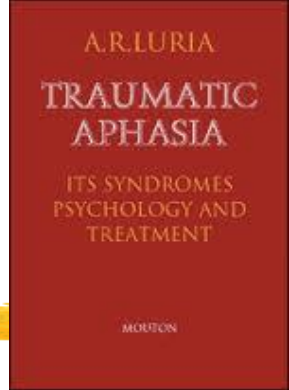


(a) his interpretation of aphasia

He criticizes both the “localizationist” point of view and the “holistic” position

Luria concludes that psychological processes are highly differentiated **functional systems**

Initial proposal (Luria, 1947/1970)



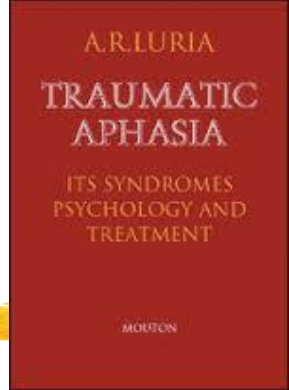
(a) his interpretation of aphasia

Luria followed the theoretical positions of **Lev Vygotsky** and **Peter Anokhin**.



- Vygotsky proposed the concept of “**psychological system**” to describe “**higher psychological functions**”
- Anokhin suggested the concept of “**functional system**” as a model to describe the structure of behavior.

Initial proposal (Luria, 1947/1970)

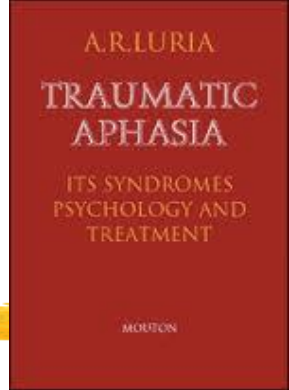


(a) his interpretation of aphasia

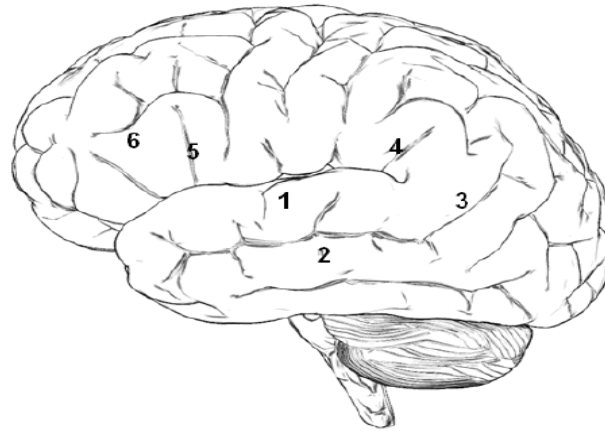
Luria states that language has a **social origin**.
Language appears as a result of the social division of work.

The emergence of language is related with important changes in the functional system structures of psychological processes.

Initial proposal (Luria, 1947/1970)

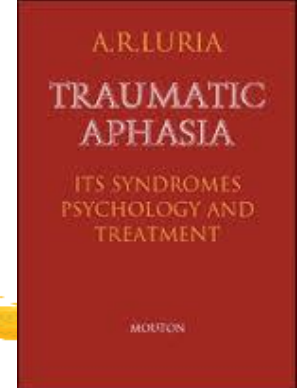


(b) Luria's classification of aphasia



Language is a complex functional system including different factors. Diverse language impairments are associated with left hemisphere lesions: (1) disturbances in phonemic discrimination; (2) impairments in verbal-acoustic memory; (3) difficulties in understanding of quasi-spatial relations and word-retrieval (semantic associations); (4) disturbances in articuleme selection; (5) speech kinetic apraxia and agrammatism; (6) adynamia of verbal processes.

Initial proposal (Luria, 1947/1970)



(b) Luria's classification of aphasia

Type of aphasia

Impaired factor

Disorders of language reception

Sensory (acoustic-gnostic)

Phoneme discrimination

Acoustic-mnesic

Verbal memory

Semantic

Semantic-based selection of word
Understanding of logic-grammatical
Quasi-spatial relations

Disorders of expressive language

Afferent motor

Articuleme selection

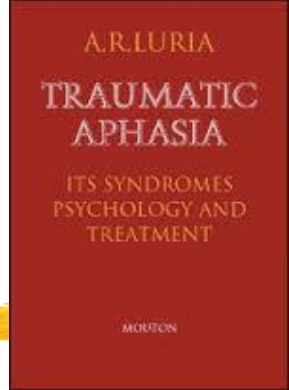
Efferent motor

Kinetic melody of speech
Grammatical structure

Dynamic

Verbal planning and initiative

Initial proposal (Luria, 1947/1970)



(c) his attempt to establish clinical/anatomical correlations using the method of superimposing the lesion drawings.

Luria used a quite ingenious procedure: considering that his patients had in most cases bullet wounds in the brains, to determine the site of the bullet entrance to the skull was not particularly difficult.

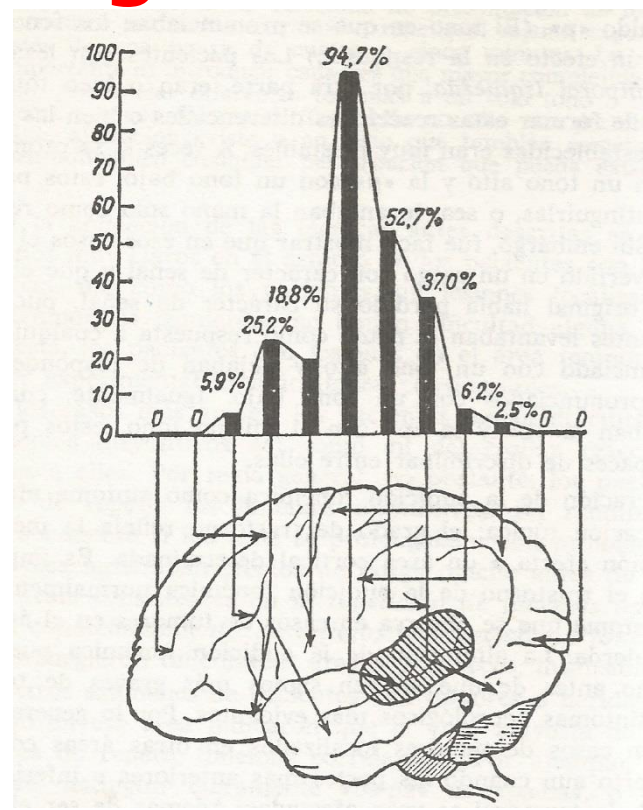
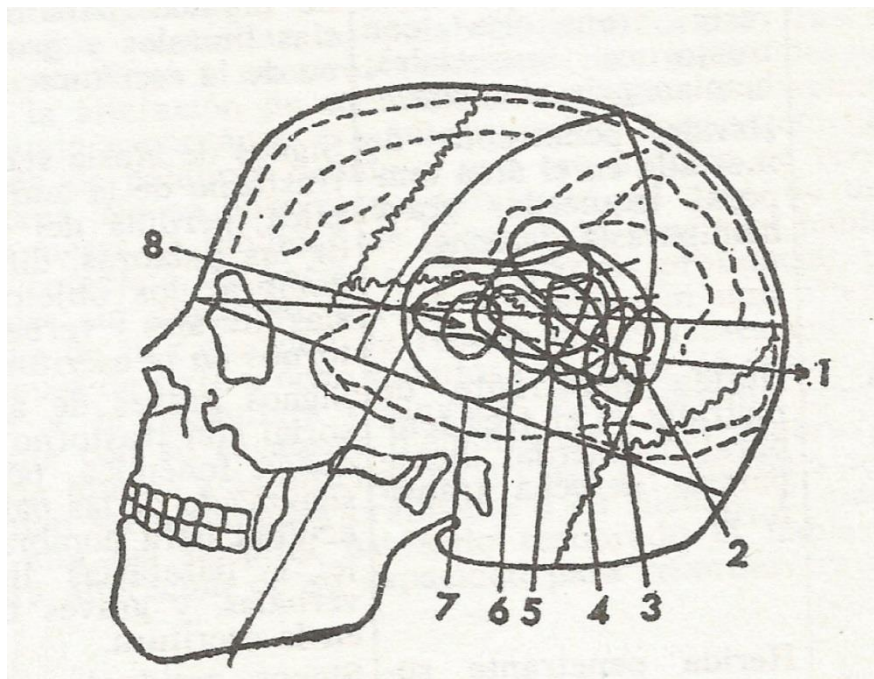
It was possible to overlap the wound diagrams in a standard drawing of the skull –as it will be done several decades later with CT scans— (Ardila, Rosselli & Pinzon, 1989; Damasio & Damasio, 1989; Kertesz, 1983).

Initial proposal (Luria, 1947/1970)

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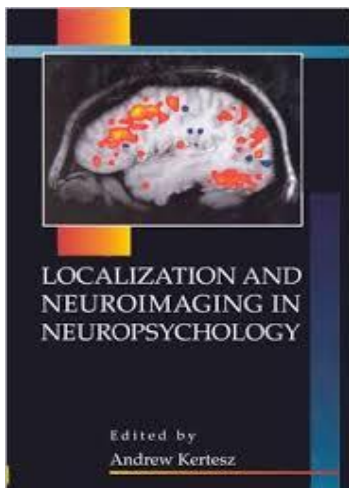
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(c) his attempt to establish clinical/anatomical correlation using the method of superimposing the lesion drawings.

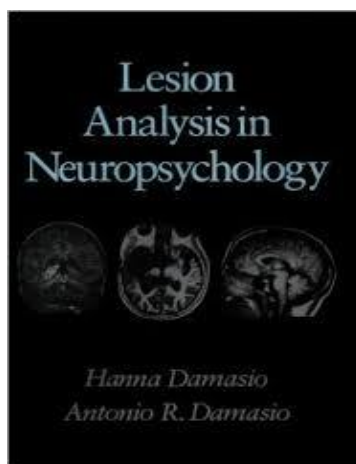


Initial proposal (Luria, 1947/1970)

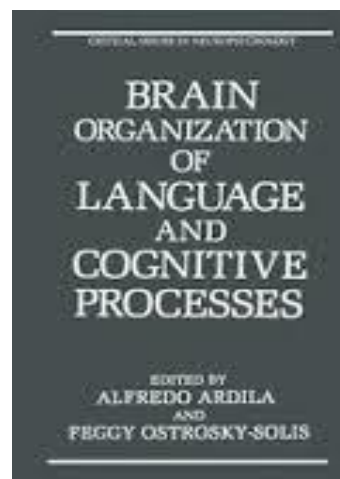
Later, with the introduction of computerized tomography this procedure was used again



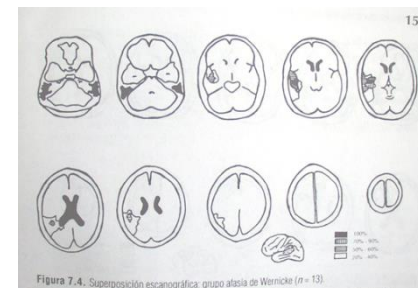
Kertesz, A. (1983)
Localization of Neuropsychology.
New York: Academic Press.



Damasio, H., & Damasio, A.R. (1989). **Lesion Analysis in Neuropsychology.** New York: Oxford University Press.



Ardila, A., & Ostrosky, F. (eds) (1989). **Brain Organization of Language and Cognitive Processes.** New York: Plenum Press.



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Final proposal (Luria, 1976)



The major differences in aphasia interpretation between his original proposals (1947) and his final proposals (1976) involved:

- (a) A critical analysis to some **contemporary** western interpretations of aphasia, basically derived from Wernicke's ideas.

How was aphasia in the 1970s?

Aphasia in the 1970s

Three major research groups:

A.R. Luria: former Soviet Union



H. Hecaen: France



N. Geschwind (Boston Group) USA



Aphasia in the 1970s

Three major research groups:

A.R. Luria former: Soviet Union

Theoretically-oriented

H. Hecaen: France

Clinically-oriented

N. Geschwind (Boston Group) USA

Theoretically-oriented



Aphasia in the 1970s

Three major research groups:

N. Geschwind (**Boston Group**) USA



Norman Geschwind



Edith Kaplan



Harold Googlass

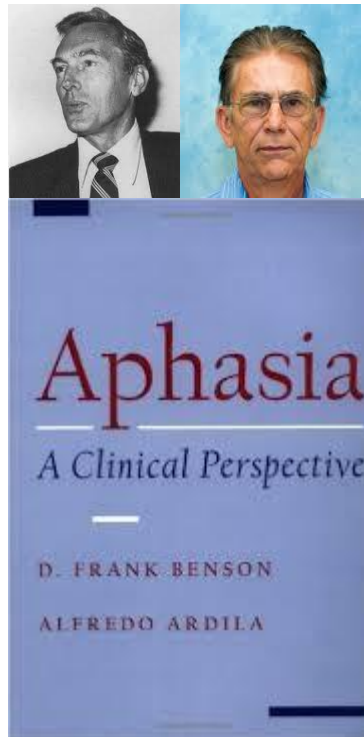


Frank Benson

“Neo-Wernickean”

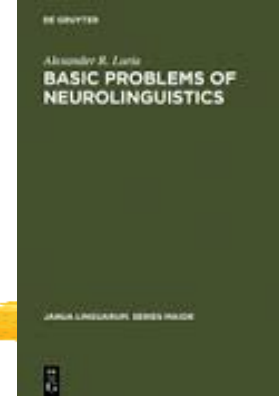
Influence in USA and western countries

Much later in 1996



One major aim of this book was to integrate Luria's and Boston Group's approaches to aphasia

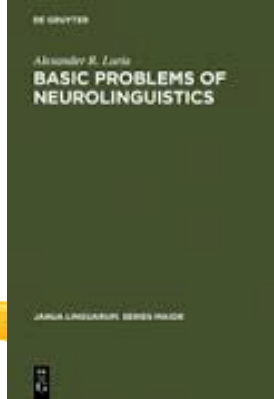
Final proposal (Luria, 1976)



The major differences in aphasia interpretation between his original proposals (1947) and his final proposals (1976) involved:

- (a) A critical analysis to some contemporary western interpretations of aphasia, basically derived from Wernicke's (1874) ideas.

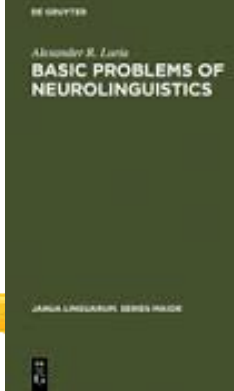
Final proposal (Luria, 1976)



The major differences in aphasia interpretation between his original proposals (1947) and his final proposals (1976) involved:

- (b) Luria seems to suggest that the original semantic aphasia is partially separated into two different aphasia syndromes.

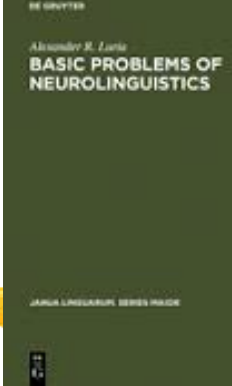
Final proposal (Luria, 1976)



The major differences in aphasia interpretation between his original proposals (1947) and his final proposals (1976) involved:

- z** (c) A significant emphasis in linguistic issues is observed in his last publications.

Final proposal (Luria, 1976)



(a) Aphasia re-analyzed

Half of the Luria's book (the whole Second Section) is devoted to analyze

- conduction aphasia
- transcortical motor aphasia
- amnesic (nominal) aphasia.

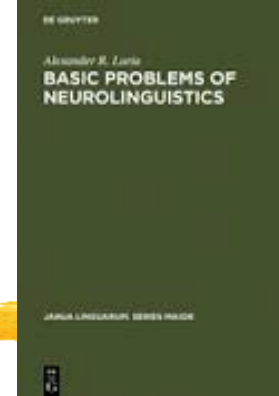
Final proposal (Luria, 1976)

(b) The fate of semantic aphasia

Semantic aphasia has been kind of neglected and confusing aphasia in the western aphasia literature.

Firstly, it is not included in the Wernicke's and derived classifications of aphasia; it was initially described only in 1926 by Head.

During the 21st century apparently only some few cases of semantic aphasia, as described by Luria, have been published in western literature



Final proposal (Luria, 1976)

(b) The fate of semantic aphasia

However, the name “semantic aphasia” has been re-introduced by some authors, but not exactly in the same way it was used by Head and Luria.

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Cognitive Neuroscience

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(doi:10.1162/jocn.2009.21289)
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Elucidating the Nature of Deregulated Semantic Cognition in
Semantic Aphasia: Evidence for the Roles of Prefrontal and
Temporo-parietal Cortices



Final proposal (Luria, 1976)

(c)The linguistic approach

Roman Jakobson published a series of papers (1964, 1971) proposing that there are two basic linguistic operations: **selecting** (language as **paradigm**) and **sequencing** (language as **syntagm**).



Final proposal (Luria, 1976)

(c)The linguistic approach

Luria further developed Jakobson's ideas in his paper "On the two basic kinds of aphasic disturbances" (1973).

Luria emphasized that the selection disorder can be observed at different levels of language, corresponding to different aphasia subtypes: phoneme selection (aphasia acoustic agnosic), word selection (aphasia acoustic amnesic), and meaning selection (amnesic aphasia).



Final proposal (Luria, 1976)

(c)The linguistic approach

TWO BASIC KINDS OF APHASIC DISORDERS

A. R. LURIA

1. THE PROBLEM

Several decades ago F. de Saussure [1] and R. Jakobson [2, 3] singled out two basic principles of the organization of language and speech.

The first was the principle of a PARADIGMATIC organization of language elements. Verbal sounds were organized in a system of oppositions, words — in a hierarchical system of meanings. This aspect is well known in psychology after the classic studies of L. S. Vygotskij.

The second principle was of another — SYNTAGMATIC — nature. 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 was shown by a series of modern psycholinguistic studies [4, 5, 6], the acquisition of speech is a rather complicated process based on mastering some 'deep' syntactic structures, which serve as a base for linguistic 'competence' and which are transformed into 'superficial' linguistic structures, different in different languages. The latter process is supposed to be a base for real linguistic 'performance'.

A problem arises: what is the psychological and psychophysiological nature of these two basic components of speech? Are they realized by the same cerebral mechanisms, or are they based on different cortical systems in which only coordination of both systems result in a normal process of speech?

Neither psychology nor psycholinguistics can answer this question.

Final proposal (Luria, 1976)

(c) The linguistic approach

Syntagmatic disorders

- z kinetic motor aphasia
- z dynamic aphasia
- z deep brain damage
- z agrammatism
- z complex forms of efferent motor aphasia.

Final proposal (Luria, 1976)

(c) The linguistic approach

Paradigmatic disorders

- z afferent motor aphasia
- z sensory (acoustic-gnostic) aphasia
- z acoustic -mnestic aphasia
- z paradigmatic disturbances in fronto-temporal damage
- z semantic aphasia

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Luria's fundamental contribution



The fundamental and clinical understanding on brain organization of language has continued advancing during the last decades after Luria's publications.

Many of his ideas has been maintained and developed; some other proposals have been forgotten or remain controversial.

Luria's fundamental contribution



The idea that the language and in general, **psychological processes represent brain functional systems** has been integrated in contemporary cognitive neurosciences.

Today it is considered as a basic idea, not as a specific author's proposal. **Contemporary brain research has emphasized that cognitive processes are supported by brain systems or brain circuits.**

Luria's fundamental contribution

Broca's area network in language function: a pooling-data connectivity study

Byron Bernal^{1}, Alfredo Ardila² and Monica Rosselli³*

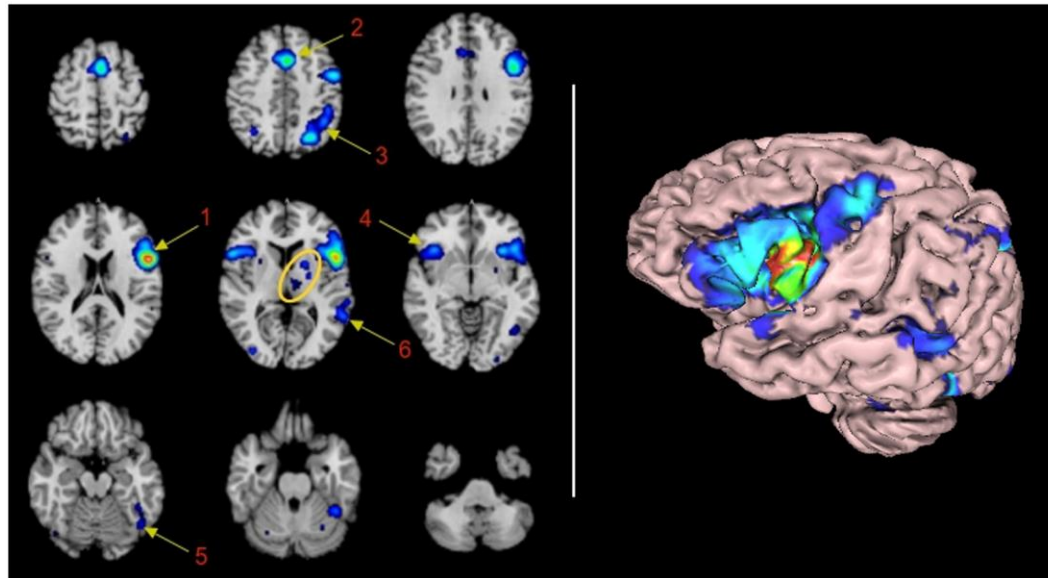


FIGURE 1 | Functional connectivity map of BA44 by Meta-analytic connectivity modeling. (Left) Transversal descending cuts of the brain MRI

corresponds to the left thalamus, with medial localization, and lenticular nucleus, with lateral and rostral position. The cerebellum

Luria's fundamental contribution



Some Luria's interpretations in aphasia have been clearly supported in contemporary research.

For instance, his point of view that **language understanding defects** in cases of left temporal damage are due to **phoneme discrimination disturbances, verbal memory defects, and impairments in semantic associations** represents today kind of basic knowledge in aphasia

Luria's fundamental contribution

By the same token, his interpretation of **dynamic aphasia** as a disturbance in planning expressive language, and hence, close to **a prefrontal (dysexecutive) syndrome** affecting the language activity has been supported by different authors (e.g., Alexander, 2006).

Journal of the International Neuropsychological Society (2006), 12, 236–247.
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DOI: 10.1017/S1355617706060309

SYMPOSIUM

Impairments of procedures for implementing complex language are due to disruption of frontal attention processes

MICHAEL P. ALEXANDER
Harvard Medical School, Behavioral Neurology Unit, Beth Israel Deaconess Medical Center, Boston, Massachusetts



Luria's fundamental contribution



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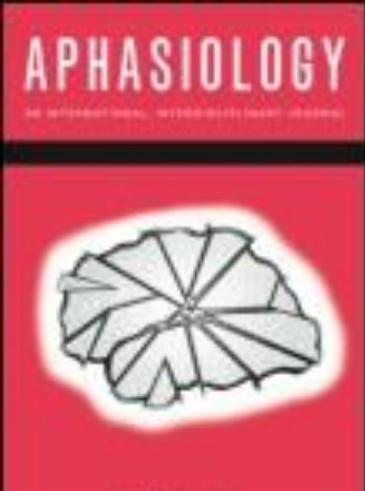
On the other hand, his interpretation of other aphasia syndromes remain polemic; for instance, **should the language defects observed in cases of left parietal damage be interpreted as a segmentary Ideomotor apraxia or a disconnection syndrome?** is a question that remains controversial.

Similarly, a clear definition of **semantic aphasia** is required in the area.

Luria's fundamental contribution



An attempt to advance Luria's classification of aphasia was presented by Ardila (2010) using as well the distinction between **paradigmatic** and **syntagmatic** language disturbances (**posterior lexical/semantic disturbances**; and **anterior syntagmatic defects**), and suggesting that certain forms of aphasia indeed do not represent primary language disturbances.



Forum

A proposed reinterpretation and reclassification of aphasic syndromes

Alfredo Ardila

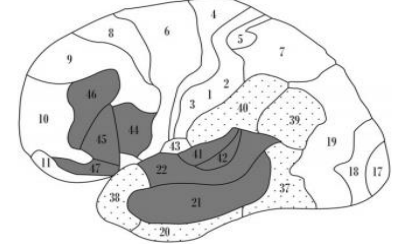
Florida International University, Miami, FL, USA

<i>Type</i>	<i>Impairment</i>
<i>Primary (central) aphasias</i>	<i>Language system impaired</i>
Wernicke-type aphasia (fluent aphasia)	Phonological level Lexical level Semantic level
Broca-type aphasia(non-fluent aphasia)	Sequencing expressive elements at syntactic and phonetic level
<i>Secondary (peripheral) aphasias</i>	<i>Mechanisms of production impaired</i>
Conduction aphasia	Disconnection (or segmentary ideomotora verbal apraxia)
SMA aphasia	To initiate and maintain voluntary speech production
<i>Dysexecutive aphasia</i>	<i>Language executive control impaired</i>
Extra-Sylvian (transcortical) motor aphasia	Executive control of language

Luria's fundamental contribution

Journal of Behavioral and Brain Science, 2011, 1, 23-36

doi:10.4236/jbbs.2011.12005 Published Online May 2011 (<http://www.SciRP.org/journal/jbbs>)



There are Two Different Language Systems in the Brain

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Abstract

In this paper it is emphasized that human language has two rather different dimensions corresponding to two different language systems: lexical/semantic and grammatical. These two language systems are supported by different brain structures (temporal and frontal), and based in different learning strategies (declarative and procedural). In cases of brain pathology, each one can be independently impaired (Wernicke aphasia and Broca aphasia). While the lexical/semantic language system may have appeared during human evolution long before the contemporary man, the grammatical language system probably represents a relatively recent acquisition. Language grammar may be the departing ability for the development of the metacognitive executive functions and is probably based in the ability to internally represent actions.

Thank you very much for your attention

Большое спасибо за внимание

