APHASIA

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APHASIA

Aphasia is an *acquired* language disorder causing deficits of production and comprehension of verbal messages in individuals with a *normal language acquisition history*.

- Aphasia can involve *the entire linguistic system*, but can also impair *single components or modalities*:
  - ✓ phonology, lexicon, morpho-syntax and semantics
  - ✓ input and output, oral and written language
• Aphasia usually follows left hemisphere damage: 1st report of the asymmetry of human brain functions (Broca, 1865).

• Language is organized around the left Sylvian fissure:
  - Broca’s area: left premotor frontal cortex (Brodmann area 44)
  - Wernicke’s area: left superior temporal cortex (BA 22).
MAJOR TYPES OF APHASIA
following WERNICKE (1874) & LICHTHEIM (1885)

- A
  - center of auditory representations of words (22)
  - auditory analysis
  - articulatory programming
  - arcuate fasciculus (exter.caps.)

- B
  - center of motor representation of words (44)
  - sensory aphasia (Wernicke’s)
  - motor aphasia (Broca’s)
  - pure verbal deafness
  - pure anarthria
  - conduction aphasia
$A$ centre of auditory representation of words (22)

$B$ centre of motor representation of words (44)

$C$ conceptual knowledge

$a$ auditory analysis

$b$ articulatory programming

$AB$ arcuate fasciculus (exter. caps.)

$AC$ transcortical sensory a.

$AB = \text{conduction aphasia}$

comprehension +

repetition -

$AC = \text{transcortical sensory a.}$

comprehension -

repetition +

$CB = \text{transcortical motor a.}$

comprehension +

repetition +

ideational-verbal inertia
WERNICKE’s MODEL (1874) & ITS ANATOMICAL CORRELATE
LIMITS OF WERNICKE & LICHTHEIM’s MODEL

• The sensory (auditory) / motor dichotomy is not sufficient to account for the fact that the majority of the patients may have a damage that involves both input and output modalities, oral and written language.

• The model cannot explain how non-lexical strings (non-words) are processed.

• Nor can it explain the existence of category-specific impairments (nouns vs verbs) and part of speech effects.
Neurolinguistics

• Investigating aphasic deficits is very useful because *language* is a function that is specific of the *human behaviour* and *brain*.

• In addition to the classical classification of aphasias, we should use also a classification based on *linguistic components*: phonology, lexicon, semantics and syntax, each of which can result selectively damaged.

• In this way we can both:
  • Provide a clinical diagnosis and evaluate the effect of the rehab treatment
  • Test cognitive models of linguistic functions
PRINCIPLES FOR ASSESSING APHASIC DEFICITS

• Anamnesis

• Spontaneous Speech

• Modality-specific Tasks
ANAMNESIS

General Anamnesis
• handedness
• past and recent clinical history

Anamnesis about pre-morbid language use
• Did the P use to talk a lot or not?
• Did the P speak other languages or dialects and when?
• How frequently did the P read (rarely, frequently, only for work)?
• How frequently did the P write (rarely, frequently, only for work)?
• Did the P use to watch TV (which programs) or to go the cinema or to the theatre?

• Anamnesis of the linguistic deficits (P & relatives)
• Evolution of the deficit since the illness onset.
• What does the P say when s/he communicates with the relatives?
• Ask for previous linguistic assessment and rehab when available.
SPONTANEOUS SPEECH

• Qualitative phenomena
  • content
  • pragmatics
  • comprehension
  • articulatory difficulties
  • phonological deficits
  • lexical (and/or lexical-semantic) deficits
  • morpho-syntactic deficits
  • automatic elements

• Conversation or description of a complex drawing
• **Content**
  - Amount of information that is communicated

• **Pragmatics**
  - alternating roles
  - anaphora (pronouns, temporal adverbs etc)
  - irony
  - indirect communicative acts

• **Comprehension**
  - questions posed by the interlocutor (who, where, when)
  - lexical-semantic decoding
  - syntactic analysis (passive, relative sentences etc)
Articulatory difficulties

A patient affected by brain damaged can show articulatory deficits which can be:

- *paretic* in nature → *dysarthria*

- due to a disorder of *programming the movements* necessary for producing linguistic sounds → *speech apraxia or anarthria*
Qualitative phenomena of articulatory deficits

**Disartria**
- Reduced intelligibility
- Slurred speech
- Dysphonia
- Nasality
- Rhythm anomalies
- Volume anomalies

**Speech apraxia** (or anarthria)
- Staccato speech
- Dysprosody
- Phonetic disintegration syndrome:
  - Voiced sounds $\rightarrow$ voiceless
  - Fricative sounds $\rightarrow$ occlusive

Spontaneous Speech

(\(lf\) $\rightarrow$ \(lp\))
Qualitative phenomena of aphasic deficits

**Phonological deficits**

phonemic paraphasias

omissions

additions

transpositions

duplications

conduites d'approche

phonemic neologisms

neologistic jargon
Lexical-semantic deficits

anomias

anomic latencies

circumlocutions

semantic paraphasias

passe-partout forms

semantic jargon

Spontaneous Speech
Morpho-syntactic deficits

aggrammatism
simplified sentence structure
telegraphic speech (omissions of function words, verbs in infinitive form)

paragrammatism
agreement errors (gender, number)
substitutions of grammatical function words
**Automatic elements**
Recurring utterances (recurrent syllabic fragments: TAN)
Automatisms
Perseverations
Echolalia

**Automatic-voluntary facilitation**
Patients, who are not able to retrieve a lexical element when asked to do it or when they would like to do it (*voluntary condition*), can sometimes manage to retrieve it if it is facilitated by the context (*automatic condition*).
MODALITY SPECIFIC TASKS

- Repetition
- Naming
- Lexical decision
- Comprehension
- Written language
• **Repetition**
  - sounds and syllables
  - words
  - non-words
  - sentences

• **Naming**
  - confrontation (line drawings, photographs)
    - objects and actions (*nouns and verbs*)
    - oral and written
  - to definition
  - fluency
    - category
    - *Initial letter*

**Lexical effects:** Worf Frequency, Age of Acquisition
• **Lexical Decision**
  – presented orally and written

• **Comprehension**
  – words and sentences
  – presented orally and written

• **Written language**
  – reading aloud
    – words, non-words, sentences
  – dictation: writing and oral spelling
    – words, non-words, sentences
### MAIN APHASIA BATTERIES

<table>
<thead>
<tr>
<th>Test</th>
<th>Authors</th>
<th>Theoretical frame</th>
<th>Language</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aachener Aphasie Test (AAT)</td>
<td>Huber, Poeck, Weniger e Willmes, 1983</td>
<td>Neuro-linguistics</td>
<td>G, D, I</td>
<td>3 h</td>
</tr>
<tr>
<td>Boston Diagnostic Language Examination (BDAE)</td>
<td>Goodglass e Kaplan, 1983</td>
<td>Neuro-linguistics</td>
<td>E, F, I, S, P</td>
<td>2 h</td>
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<tr>
<td>Esame del Linguaggio (2 ed)</td>
<td>Ciurli, Marangolo e Basso, 1996</td>
<td>Neuro-linguistics</td>
<td>I</td>
<td>2-3 h</td>
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<tr>
<td>Western Aphasia Battery (WAB)</td>
<td>Kertesz, 1979; 1982</td>
<td>Neuro-linguistics</td>
<td>E, P</td>
<td>1-2 h</td>
</tr>
<tr>
<td>Batteria per l'analisi dei deficit afasici (BADA)</td>
<td>Miceli, Laudanna, Burani e Capasso, 1996</td>
<td>Psycholinguistics</td>
<td>I</td>
<td>8 h</td>
</tr>
<tr>
<td>Psycholinguistic Assessment of Language Processing in Aphasia (PALPA)</td>
<td>Kay, Lesser e Coltheart, 1992</td>
<td>Neuro-linguistics</td>
<td>E</td>
<td>1-6 h</td>
</tr>
<tr>
<td>Communication Abilities in Daily Living (CADL)</td>
<td>Holland, 1980</td>
<td>Pragmatics</td>
<td>E, I</td>
<td>1 h</td>
</tr>
</tbody>
</table>
TOKEN TEST
SPONTANEOUS SPEECH

Cookie Theft
(BDAE, Kaplan & Goodglass, 1983)
## Fluent & Non-Fluent Deficits

<table>
<thead>
<tr>
<th>Deficit</th>
<th>Fluent Aphasias</th>
<th>Non-Fluent Aphasias</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <em>speech characteristics:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amount of speech</td>
<td>abundant</td>
<td>reduced</td>
</tr>
<tr>
<td>length of sentences</td>
<td>long</td>
<td>short</td>
</tr>
<tr>
<td>• <em>qualitative phenomena:</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>speech apraxia</td>
<td>--</td>
<td>+/-</td>
</tr>
<tr>
<td>agrammatism</td>
<td>--</td>
<td>+/-</td>
</tr>
<tr>
<td>paragrammatism</td>
<td>+/-</td>
<td>--</td>
</tr>
<tr>
<td>jargon</td>
<td>+/-</td>
<td>--</td>
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</tbody>
</table>

- absence / + presence
## FLUENT APHASIAS

<table>
<thead>
<tr>
<th>Deficit</th>
<th>Ph, Lex, M-Synt</th>
<th>Ph</th>
<th>Lex-Sem</th>
<th>Lex(output)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oral expression:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speech apraxia</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>agrammatism</td>
<td>--</td>
<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>paragraphmatism</td>
<td>+/-</td>
<td>-/+</td>
<td>+/-</td>
<td>--</td>
</tr>
<tr>
<td>jargon</td>
<td>+/-</td>
<td>--</td>
<td>+/-</td>
<td>--</td>
</tr>
<tr>
<td><strong>Other verbal tasks:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>comprehension deficit</td>
<td>±/++++</td>
<td>-/±</td>
<td>+++</td>
<td>-/±</td>
</tr>
<tr>
<td>repetition deficit</td>
<td>+/++++</td>
<td>++</td>
<td>--</td>
<td>-/±</td>
</tr>
<tr>
<td>naming deficit</td>
<td>+/++++</td>
<td>-/+</td>
<td>++(+)</td>
<td>++</td>
</tr>
</tbody>
</table>

- absence / + presence
# NON FLUENT APHASIAS

<table>
<thead>
<tr>
<th>Deficit</th>
<th>Broca’s aphasia</th>
<th>global aphasia</th>
<th>transcortical motor aphasia</th>
<th>double transcortical a.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oral expression:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>speech apraxia</td>
<td>+/-</td>
<td>+/-</td>
<td>--</td>
<td>+/-</td>
</tr>
<tr>
<td>agrammatism</td>
<td>+/-</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
</tr>
<tr>
<td>paragrammatism</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>comprehension deficit</td>
<td>+/-±</td>
<td>+++</td>
<td>--</td>
<td>+++</td>
</tr>
<tr>
<td>repetition deficit</td>
<td>+/+±</td>
<td>+++</td>
<td>--</td>
<td>±</td>
</tr>
<tr>
<td>naming deficit</td>
<td>++/+±</td>
<td>+++</td>
<td>--</td>
<td>+++</td>
</tr>
</tbody>
</table>

- absence / + presence
FLUENT VS NON-FLUENT APHASIA

• **Fluent** aphasia is usually caused by left *temporal* damage;

• **Non-fluent** aphasia by left *premotor* damage, or – much more frequently – by lesions **ALSO** involving the left *premotor area*.

![Diagram showing Wernicke’s (fluent) aphasia and Broca’s (non fluent) aphasia](image)

Wernicke’s (fluent) aphasia  Broca’s (non fluent) aphasia