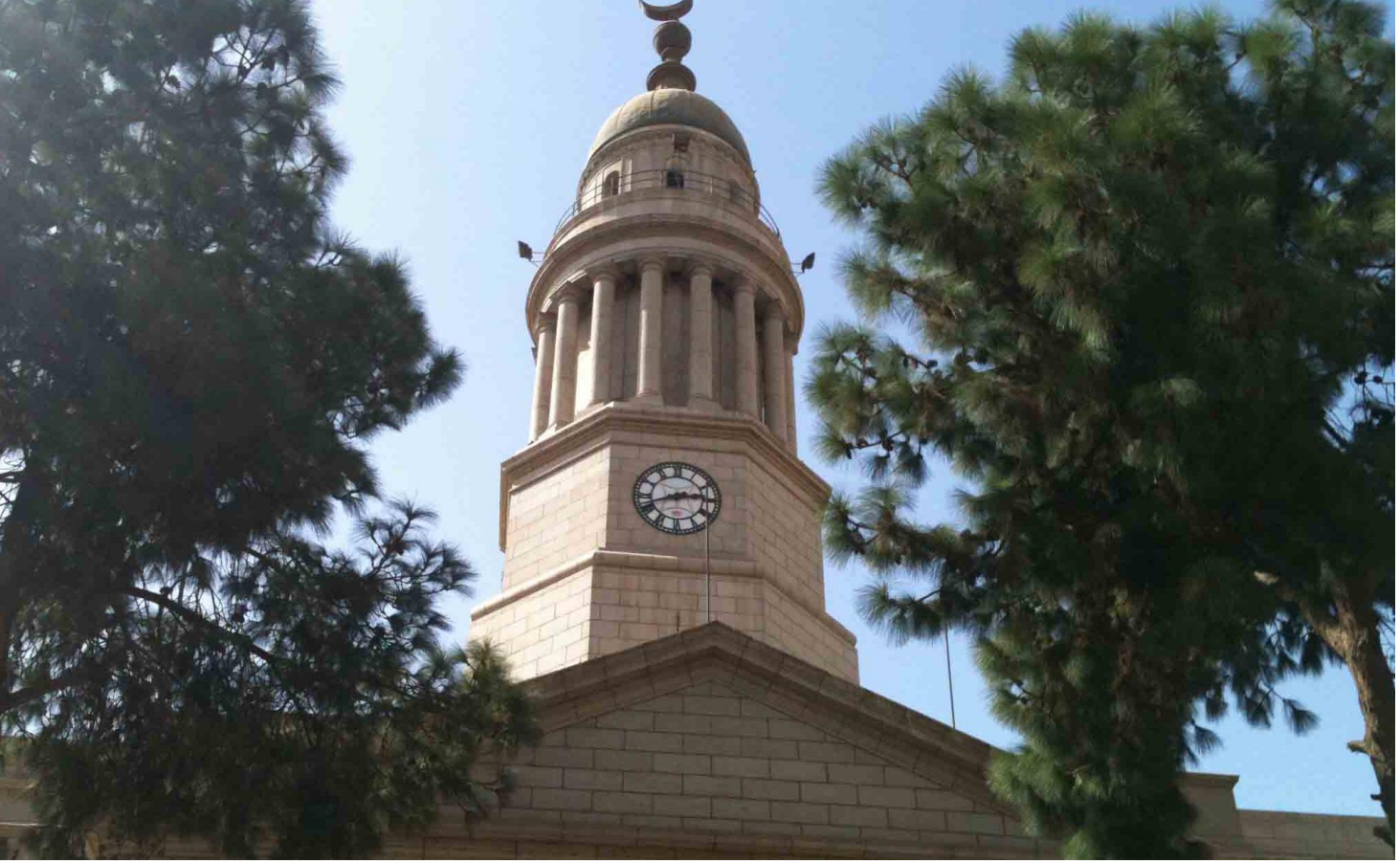

SPEECH DISORDERS

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Definition of Speech

Speech is the communication of meanings by means of symbols, which usually take the form of spoken or written words.

Mechanisms of Speech :

1. Central Mechanisms:

Depending on the integration of the higher brain centers for symbolization (speech centers), mainly in the dominant hemisphere.

Lesion leads to Dysphasia or Aphasia.

2. Peripheral Mechanisms:

A. Articulation:

Lesion leads to Dysarthria or Anarthria.

B. Phonation:

Lesion leads to Dysphonia or Aphonia.

Aphonia

- Phonation is lost but articulation is preserved
- The patient talks in whisper

Types and Causes:

A. Hysterical *(can phonate when coughing)*

B. Organic

1. Bilateral paralysis of the vocal cords
2. Diseases of larynx
3. Paresis of respiratory movements
4. Spastic dysphonia
5. Glottis spasm

Dysarthria

Dysarthria=Disorder of articulation

Types and Causes:

1. LMN Dysarthria
2. UMN (spastic) Dysarthria
3. Extra-pyramidal Dysarthria
    a. Rigid dysarthria: Parkinsonism
    b. Hiccup speech: Chorea and myoclonus
4. Cerebellar Dysarthria
    a. Syllabic (or scanning)
    b. Explosive
    c. Stacatto

Mechanisms of Speech :

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Lesion leads to Dysarthria or Anarthria.

B. Phonation:

Lesion leads to Dysphonia or Aphonia.

Speech Centers

I. Sensory Centers:

A. Visual Centers:

Area 17 for visual reception.

Area 18 for visual perception (recognition).

Area 19 for visual recall.

Area 39 for recognition and recall of mathematic numbers and figures.

B. Auditory Centers:

Area 41 & 42 for auditory reception.

Area 22 for auditory perception (recognition) and recall.

Speech Centers

II. Motor Centers:

A. Speech Motor Center:

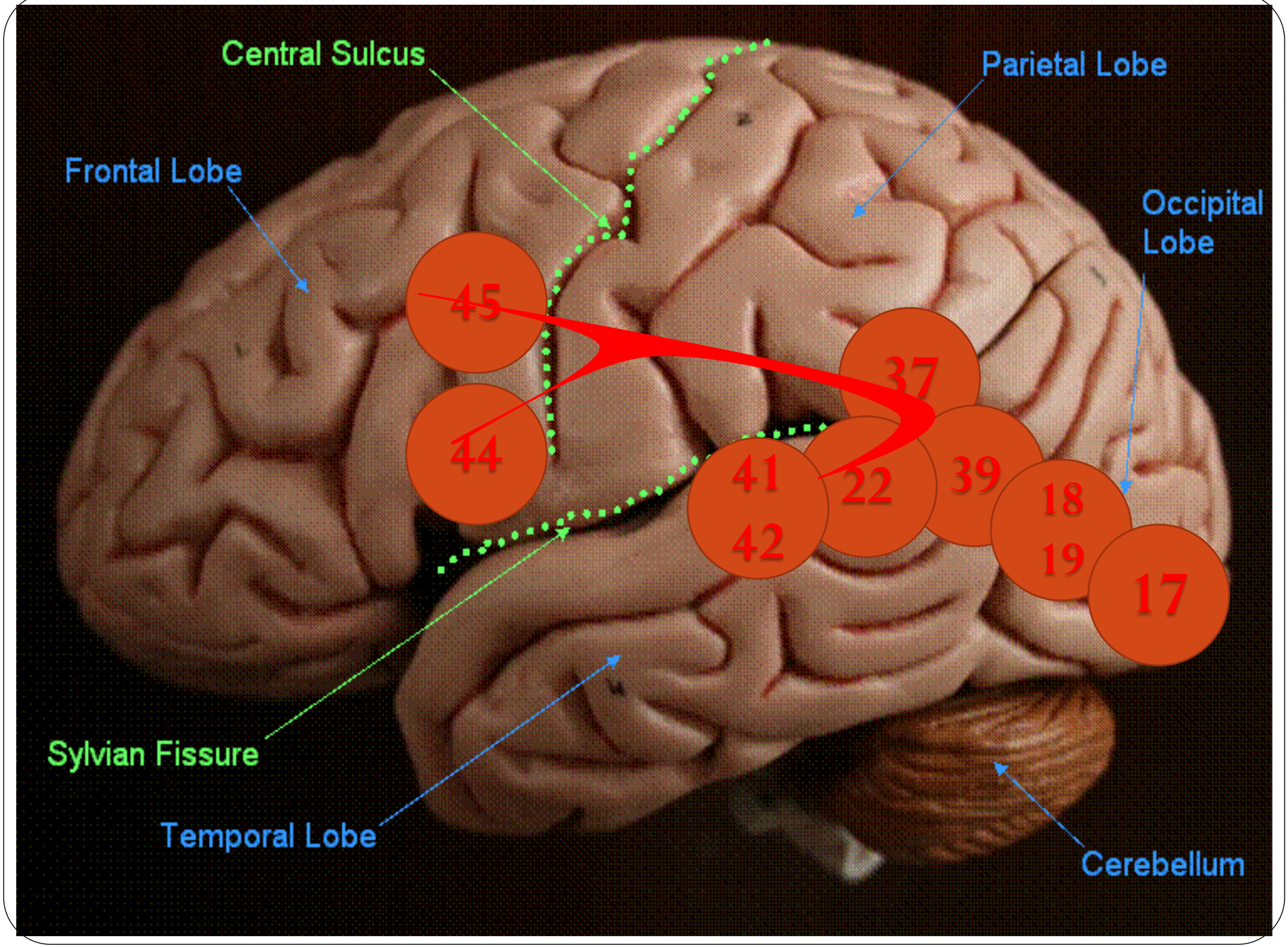
Area 44

B. Writing Motor Center:

Area 45

III. Associative Center:

Area 37


Central Sulcus
Parietal Lobe
Frontal Lobe
Occipital Lobe
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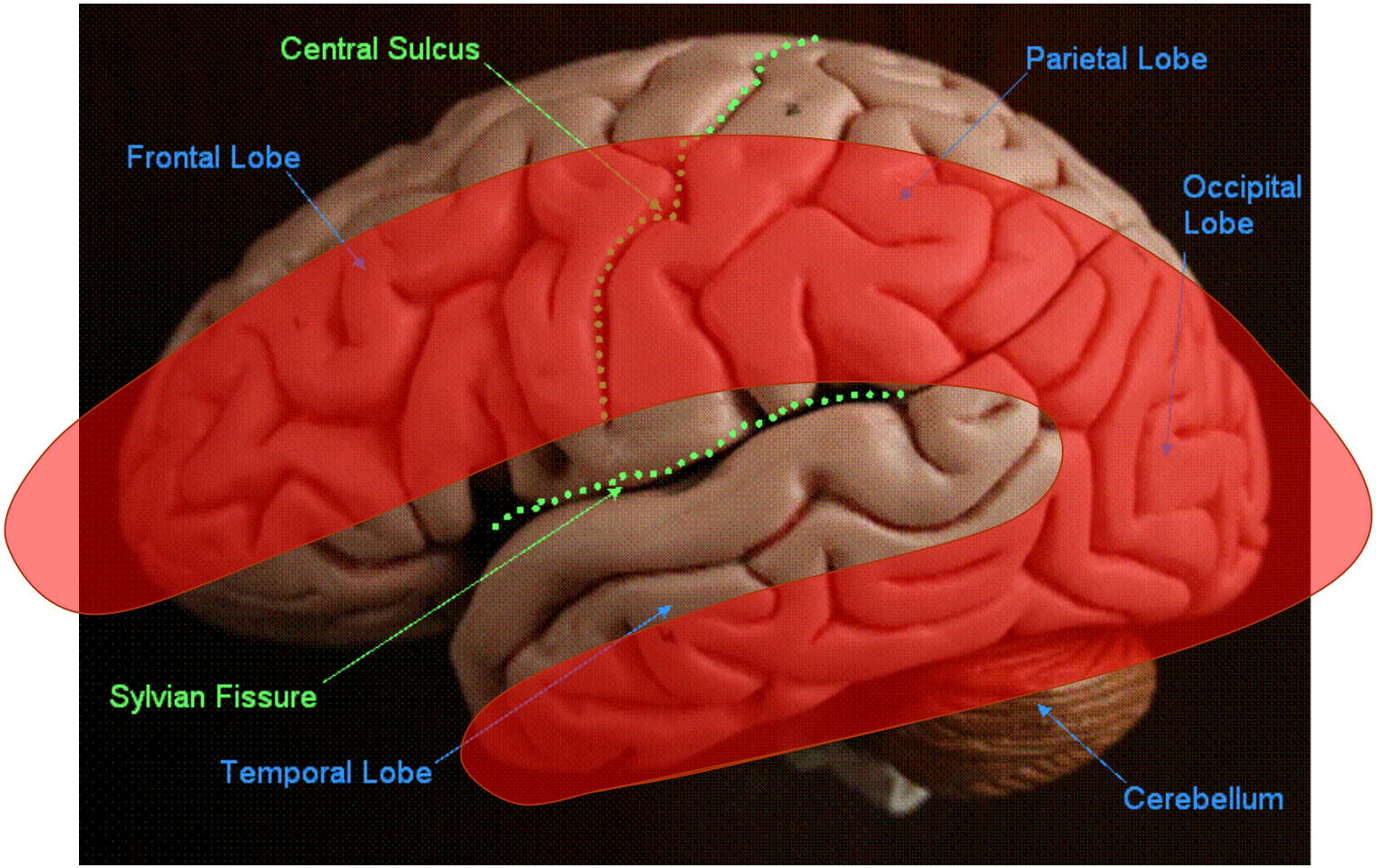
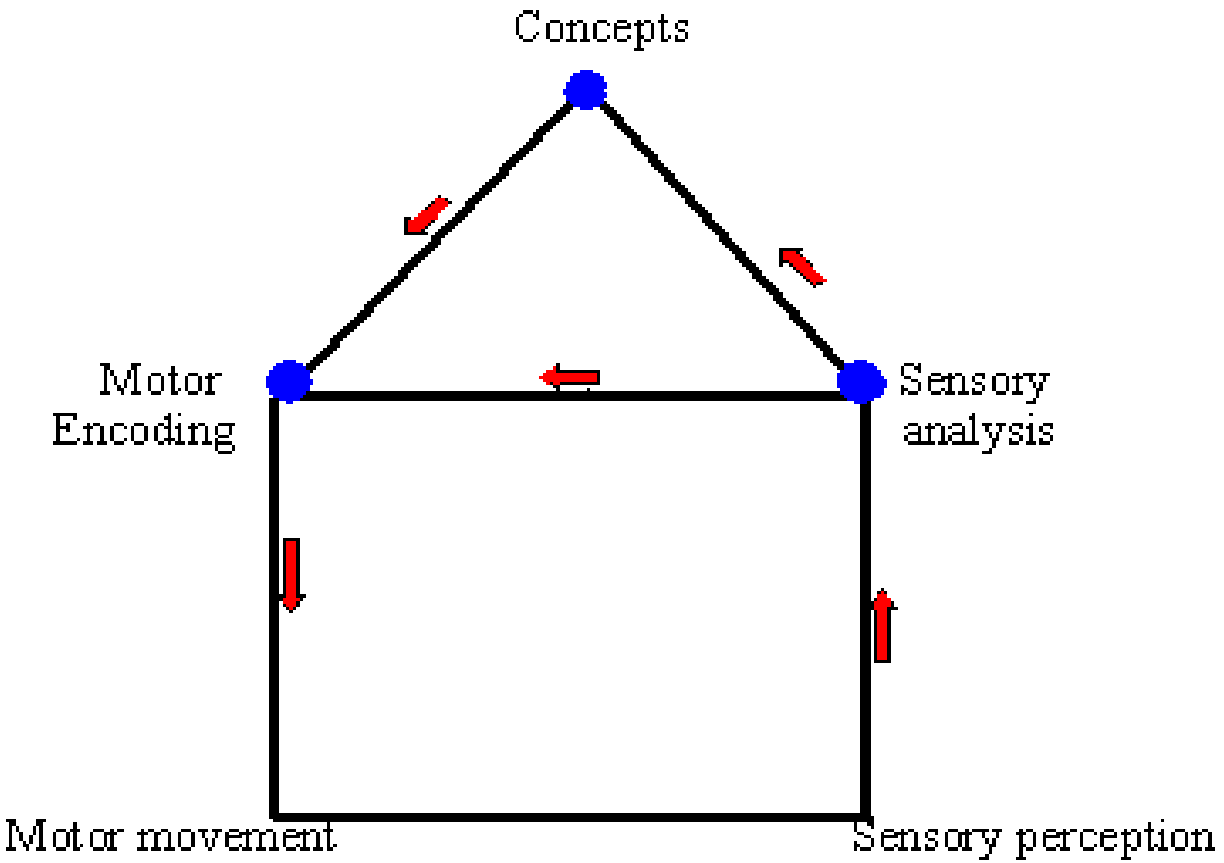
Sylvian Fissure
Temporal Lobe
Cerebellum

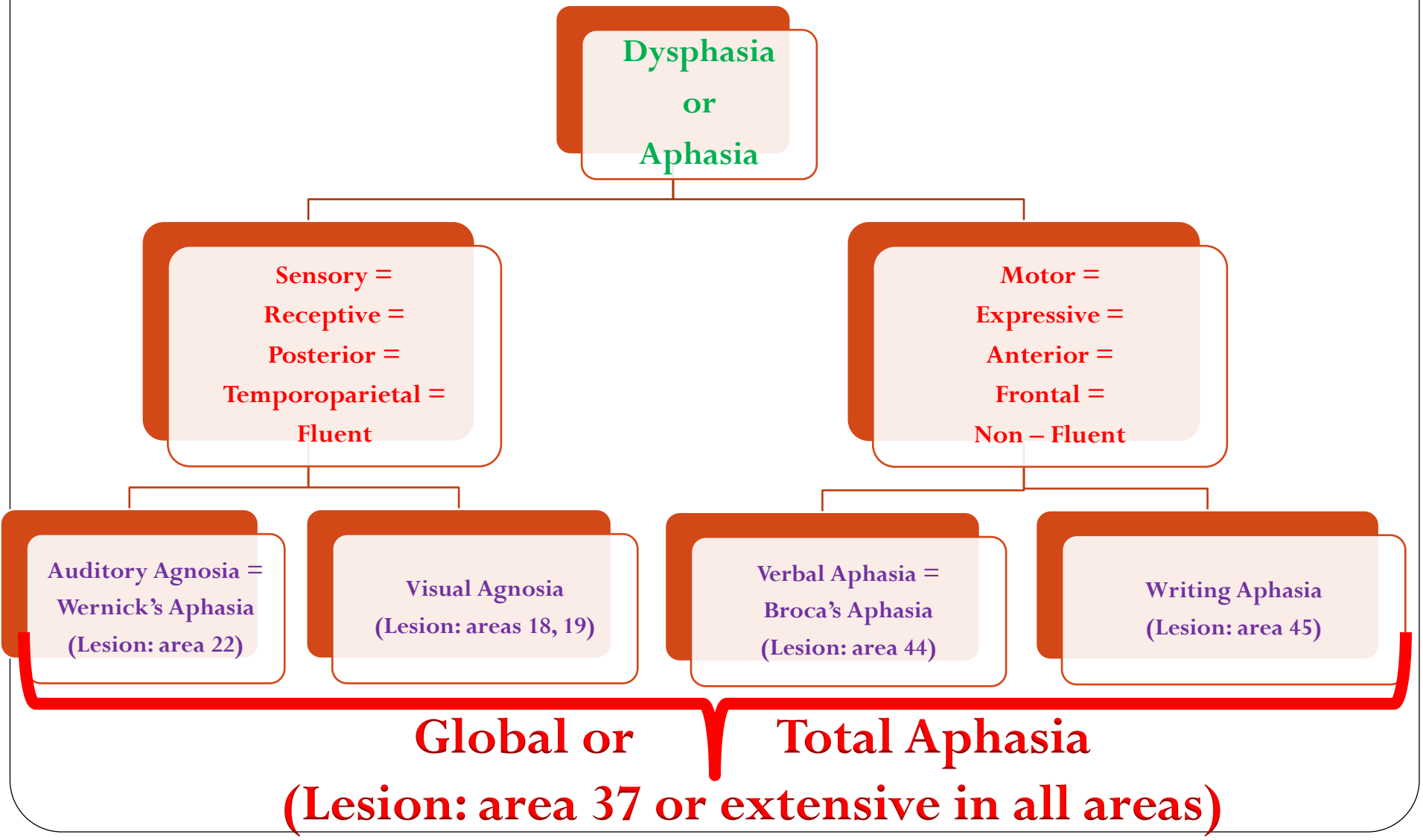
Border Zone Territory



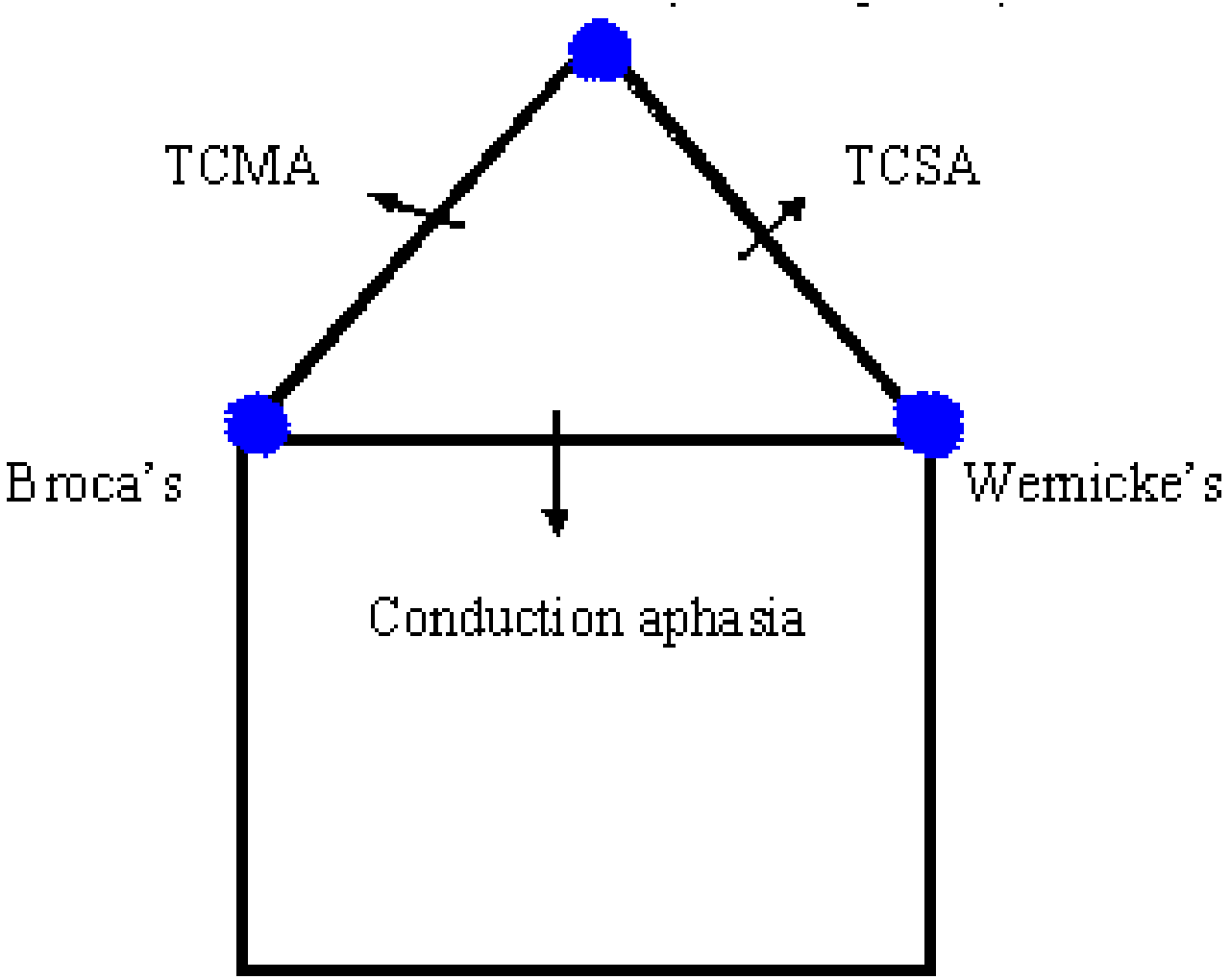
Connectionist model of language



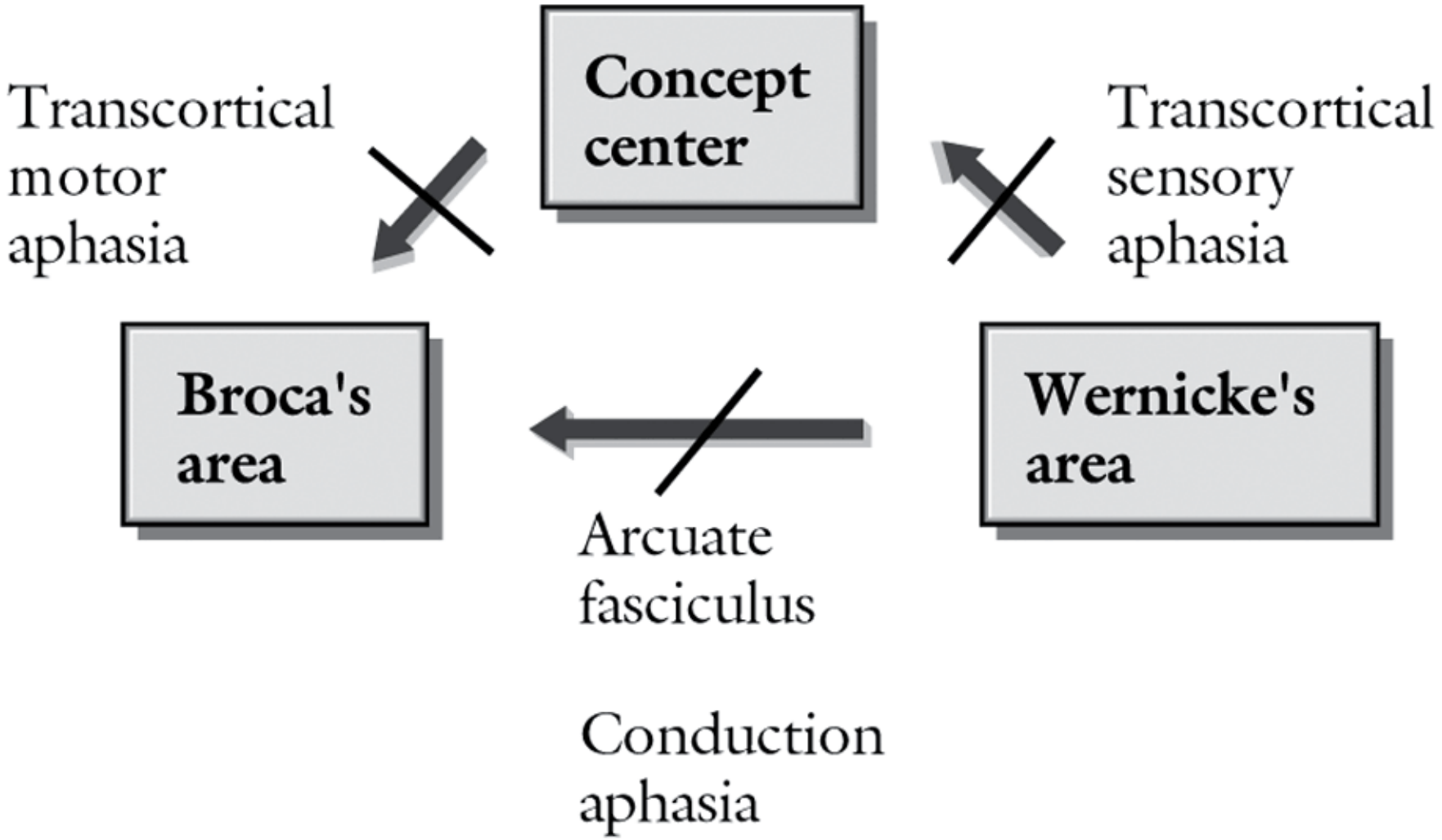
Aphasia Classification: Basic Classification



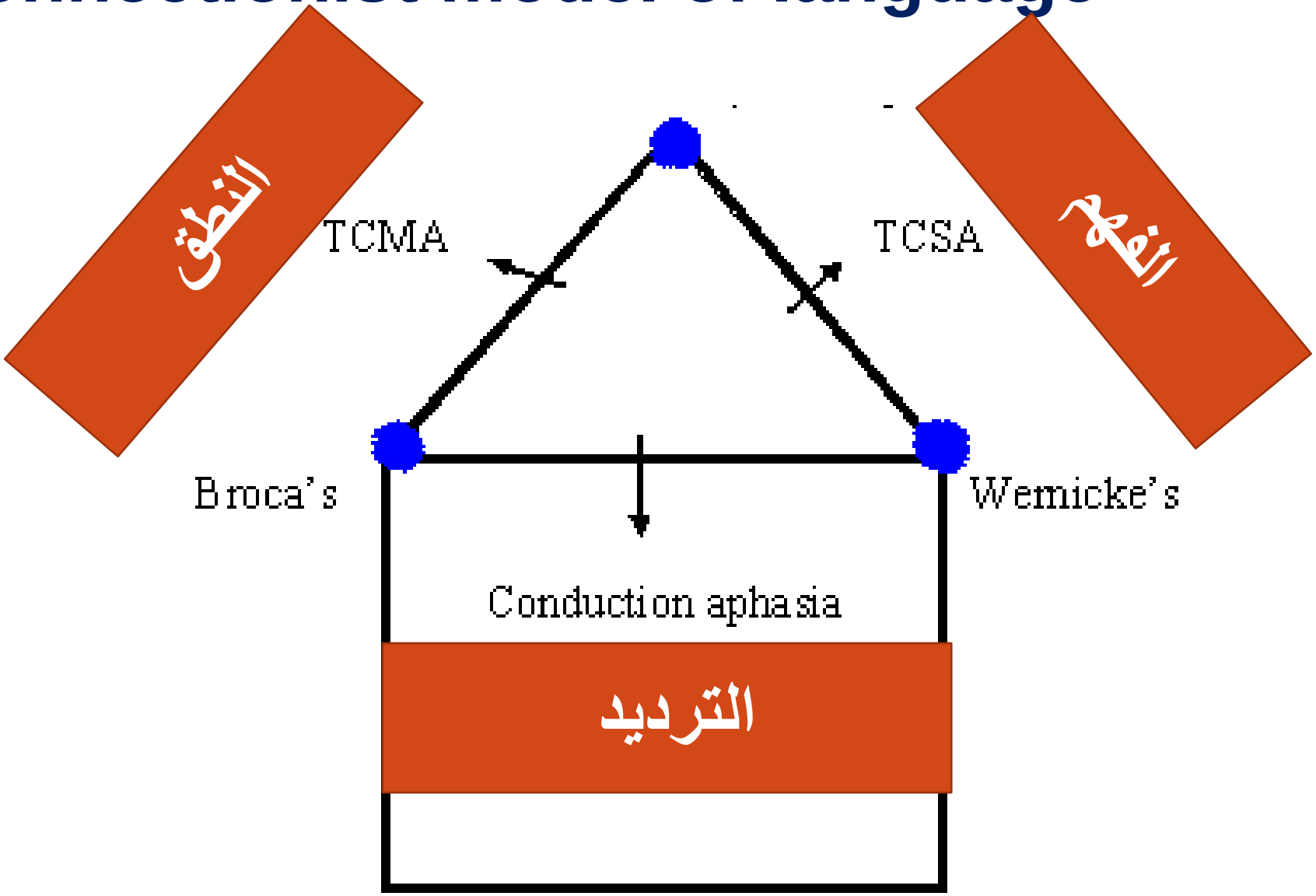
Connectionist model of language



Developing a Model of Language in the Brain



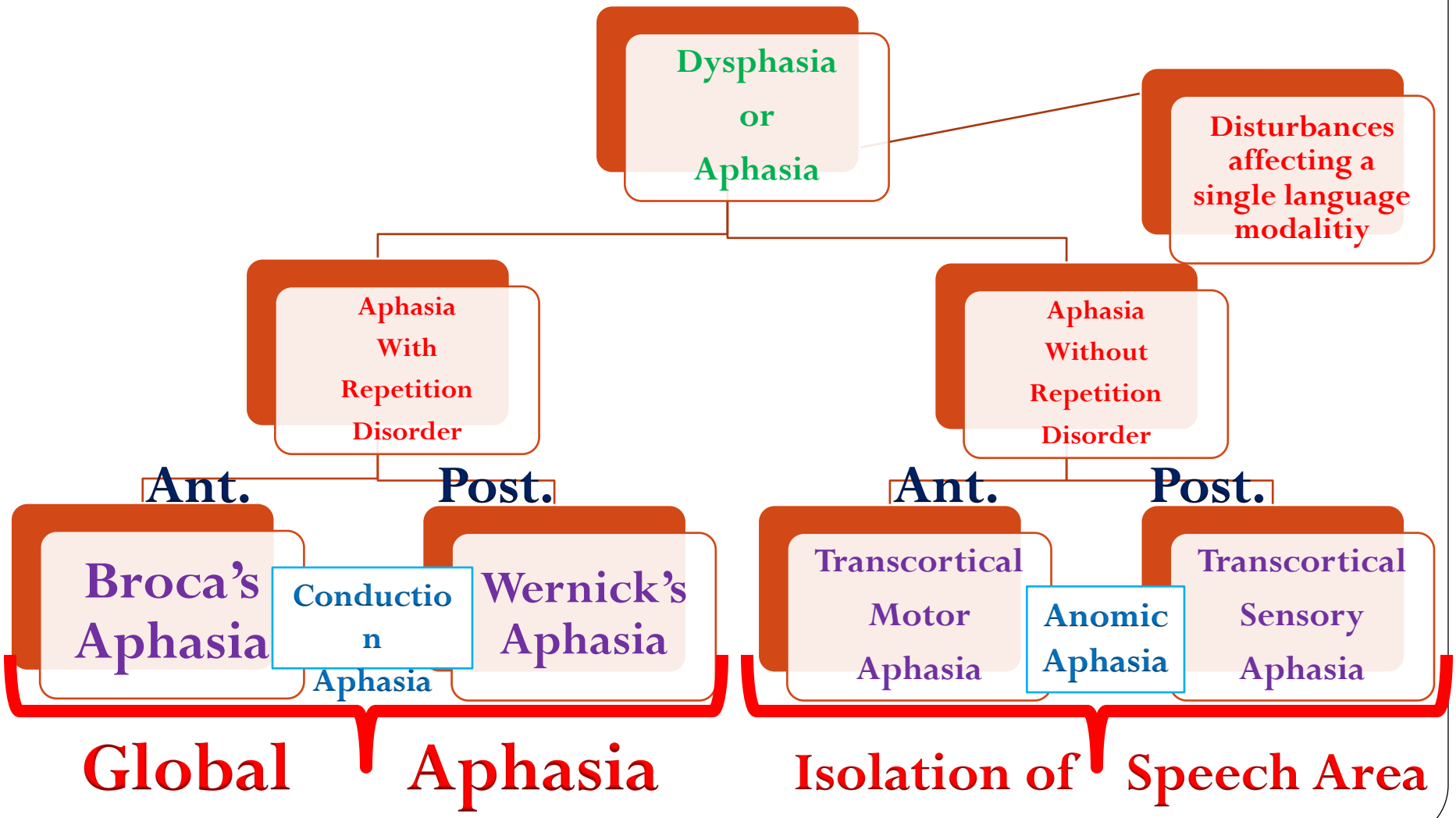
Connectionist model of language



Repetition

Lesions involving speech areas in the *immediate perisylvian region* interfere with this language function and produce aphasia with repetition disorder.

Aphasia Classification:
Benson & Geschwind Classification



Evaluation of Aphasia & speech

I. Spontaneous Speech:

- Rate of output
- Pronunciation
- Effort in initiation
- Press of speech
- Phrase length
- Prosody
- Paraphasias
- Word content

Evaluation of Aphasia & speech

II. Comprehension

III. Repetition

IV. Naming

V. Reading

VI. Writing

Language Deficits

- Aphasia – spoken language
- Alexia – reading
- Agraphia - writing
- Anomia - naming
- Dysarthria - articulation

Types of Language Errors

- Paraphasia:
- Neologism:
  - Paraphasia with a completely novel word

Paraphasia

- **Substitution of a word by a sound, an incorrect word, or an unintended word**
- **It is common with *posterior* aphasias.**

Varities:

1. **Phonemic or Literal (e.g. open the *boor*)**
2. **Semantic or Verbal (e.g. open the *glass*)**
3. **Neologistic (e.g. open the *blastorole*)**

Jargon aphasia

- Speech is totally incomprehensible.

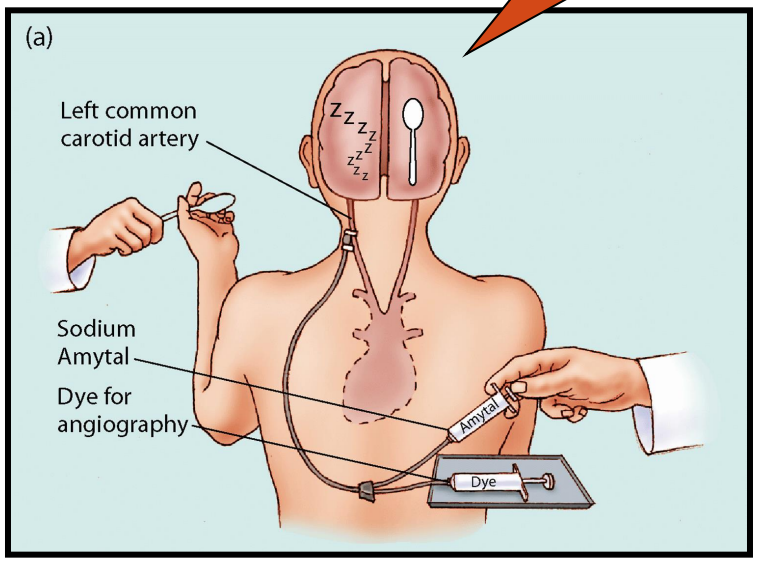
- It may occur in cases of Wernicke's and global aphasia.

Nonfluent speech

- Talking with considerable effort

Converging Evidence
Wada Test

- Left hemisphere role in language
- Wada technique using sodium amobarbital
- **Crossed aphasia** – aphasia arising from right hemisphere damage



Right Hemisphere Contribution to Language

- **Narrative** – ability to construct or understand a story line
- **Inference** – ability to "fill in the blanks"
- **Prosody**

Prosody (Monrad krohn, 1947)

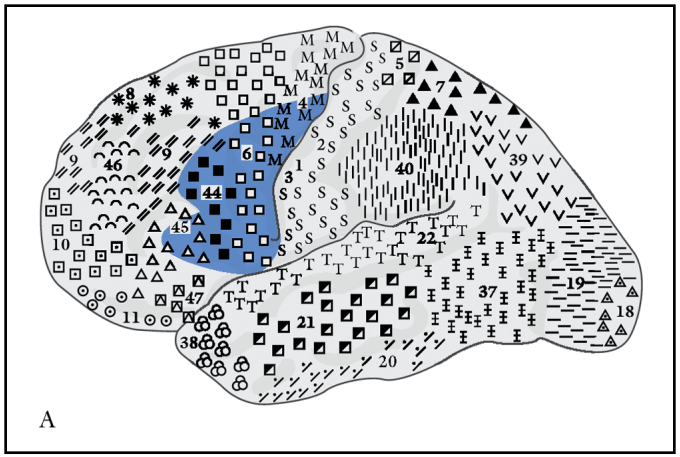
- The intonation pattern, or sound envelope, of an utterance (interpreting whether the tone is friendly, sarcastic, condescending or excited)
- It is the *melody* of speech ("we need to talk" vs. "we need to talk")
- It is more common with *anterior* aphasias.
- Thought to be mainly a function of the *nondominant* cerebral hemisphere.

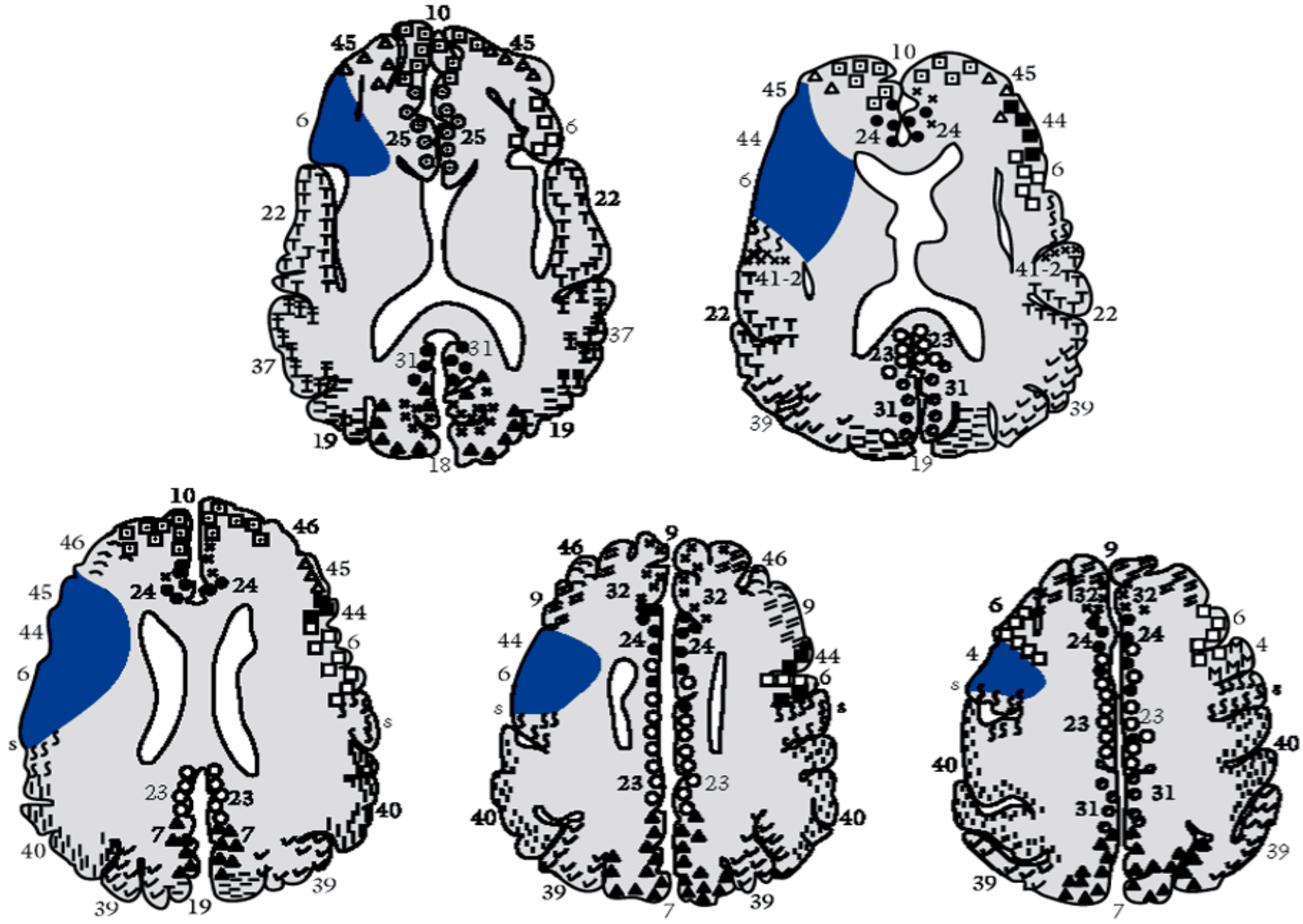
Broca's Aphasia

- Patient "Tan"
- Brain tumor in Left frontal brain region
- Broca: Lesion disrupted speech

Broca's Aphasia

- Associated with damage in the frontal lobe
- Not due to damage to the motor strip

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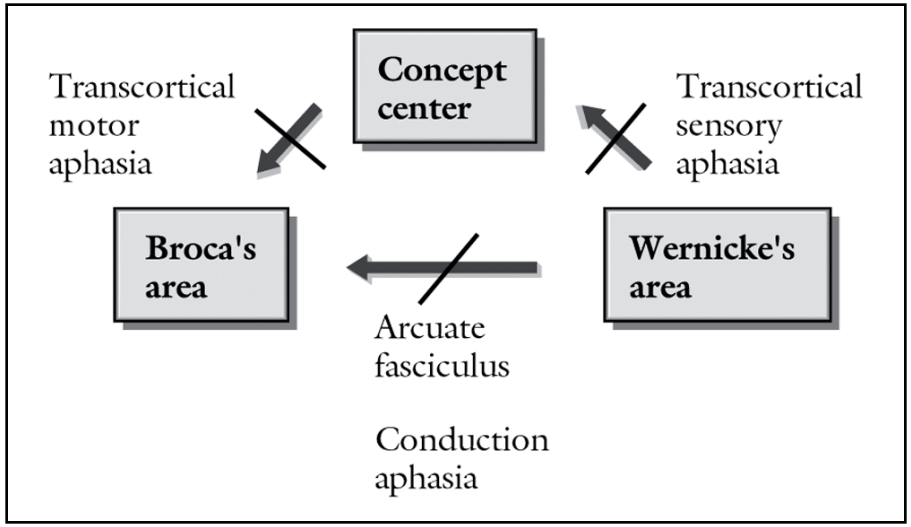
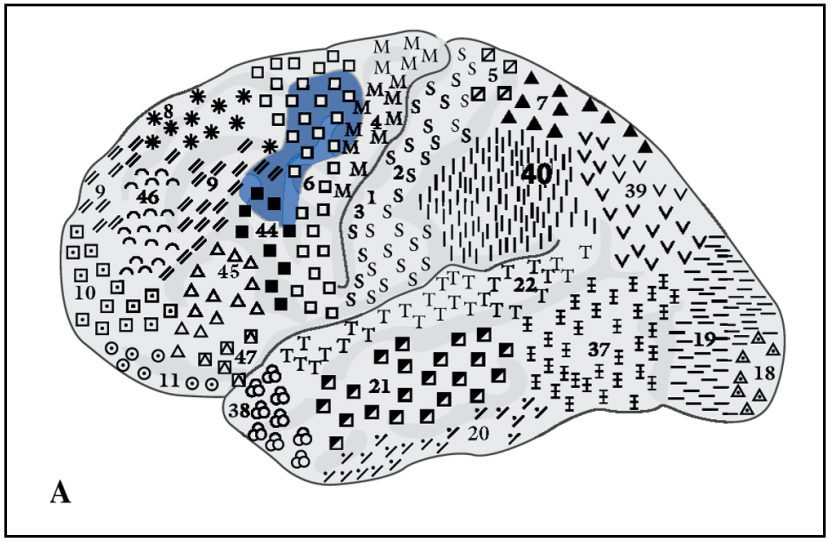
Transcortical Motor Aphasia

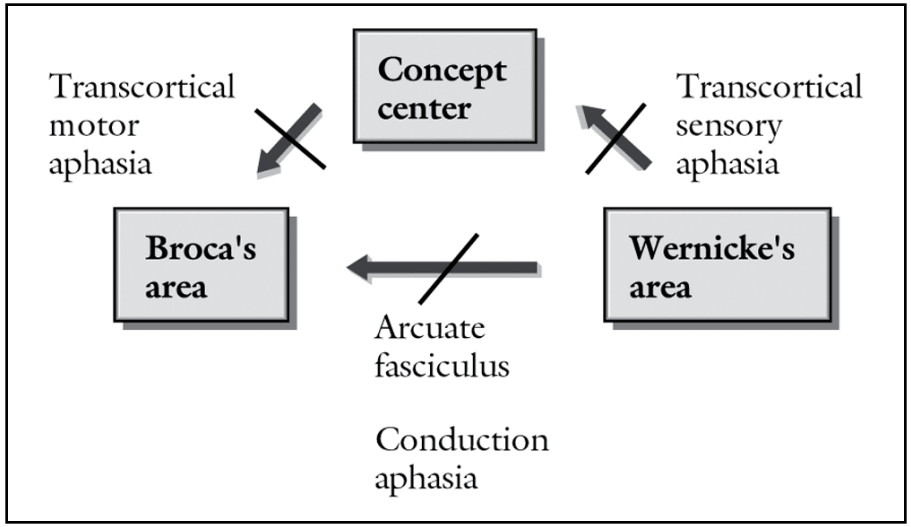
- ***Transcortical motor aphasia*:** Comprehension and repetition are preserved, however, speech is nonfluent

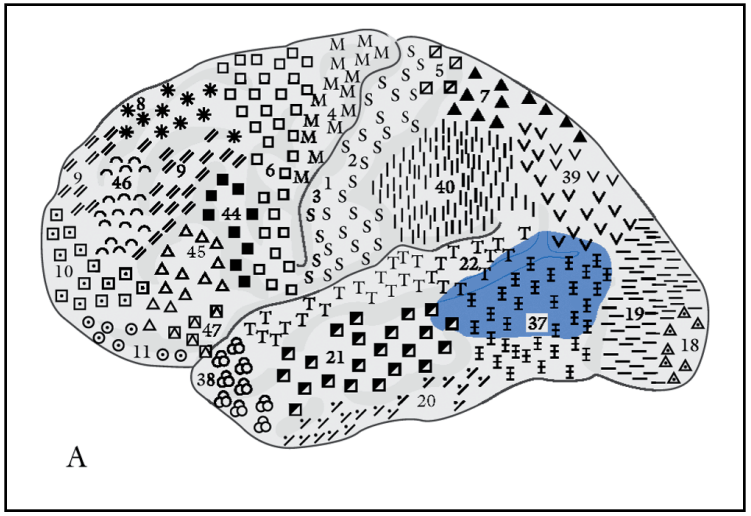




Transcortical Sensory Aphasia

- ***Transcortical sensory aphasia*****:** Repetition is preserved, speech is fluent but comprehension is impaired





Wernicke's Aphasia

- Carl Wernicke
- 2 patients – fluent, but nonsensical sounds, words, sentences
- Damage in the posterior region of the superior temporal gyrus.

Wernicke's Aphasia

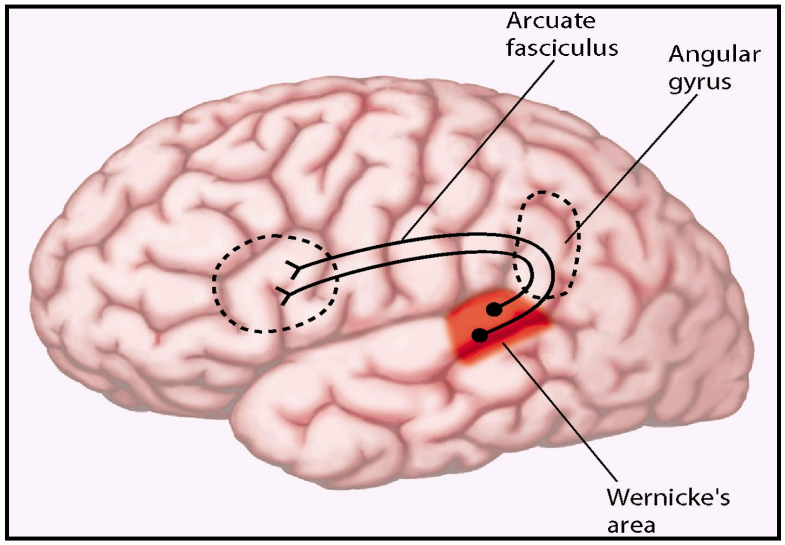
- Problems in comprehending speech – input or reception of language
- Fluent meaningless speech (Word salad).
- **Paraphasias** – errors in producing specific words

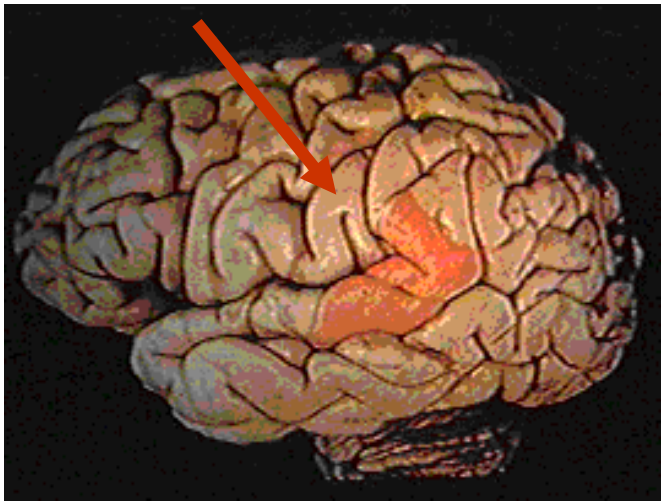
  Semantic paraphasias – substituting words similar in meaning ("barn" – "house")

  Phonemic paraphasias – substituting words similar in sound ("house" – "mouse")

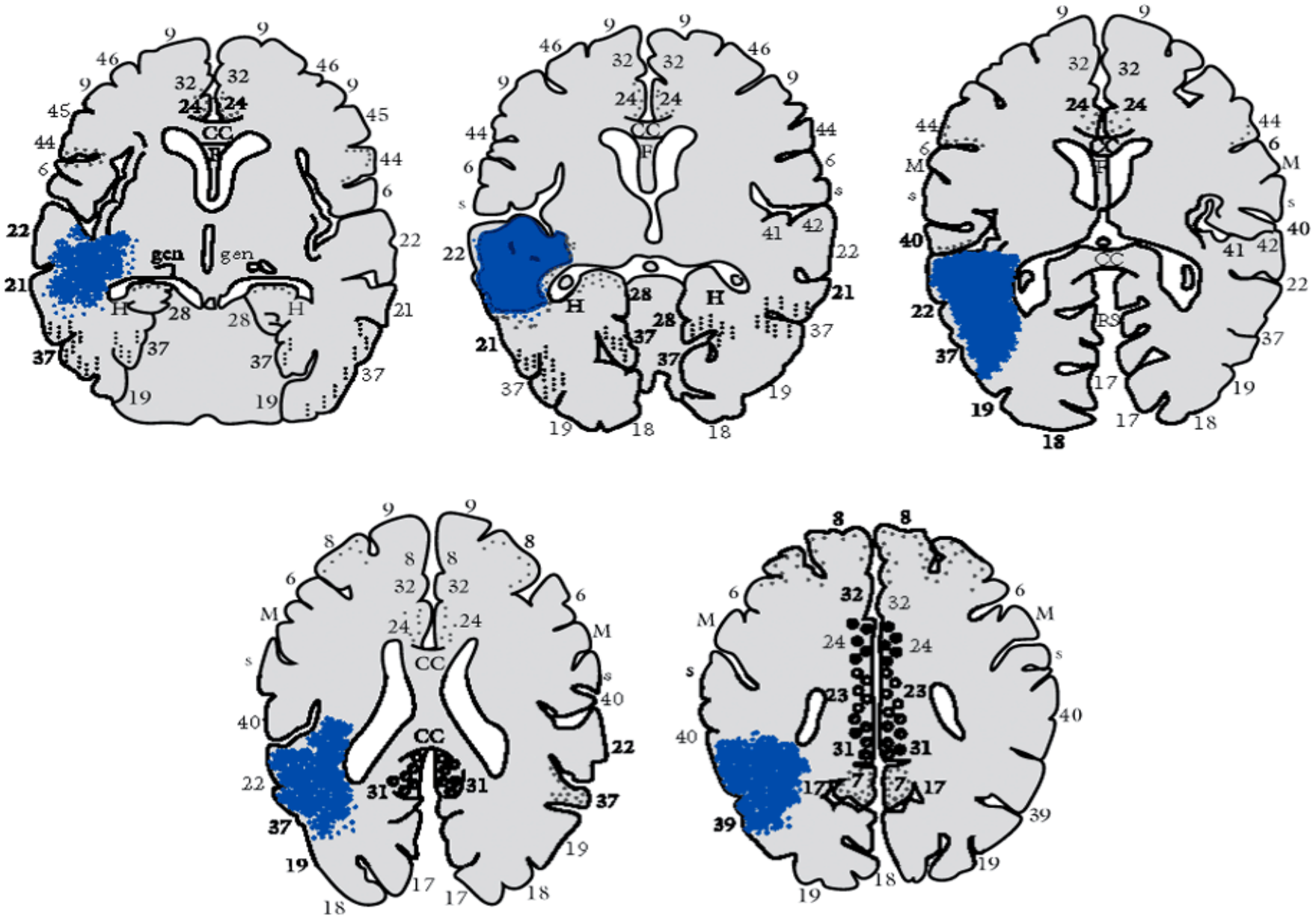
  Neologisms – non words ("galump")
- Poor repetition
- Impairment in writing

Wernicke's Aphasia





- Left temporal lobe damage



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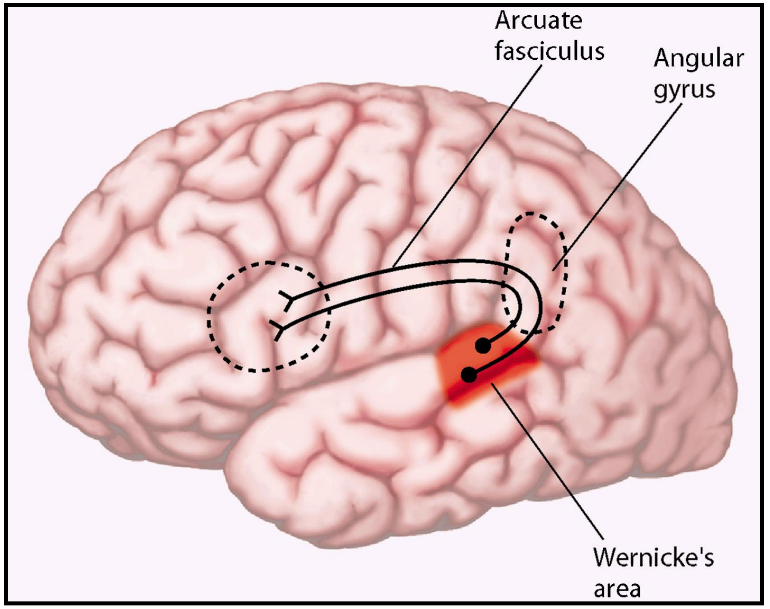
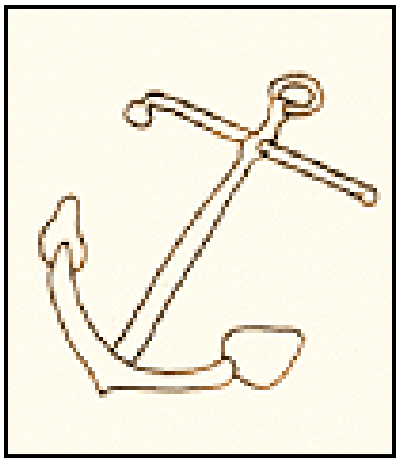
Fluent Aphasia
Conduction Aphasia

- Difficulty in repeating what was just heard (no repetition or paraphasias).
- Comprehension and production intact.



Fluent Aphasia
Anomic Aphasia

- "Amnesic aphasia"
- Comprehend speech
- Fluent speech
- Repetition OK
- Cannot name objects
- Naming problems tend to be a result of temporal damage, whereas verb finding problems tend to be a result of left frontal damage.

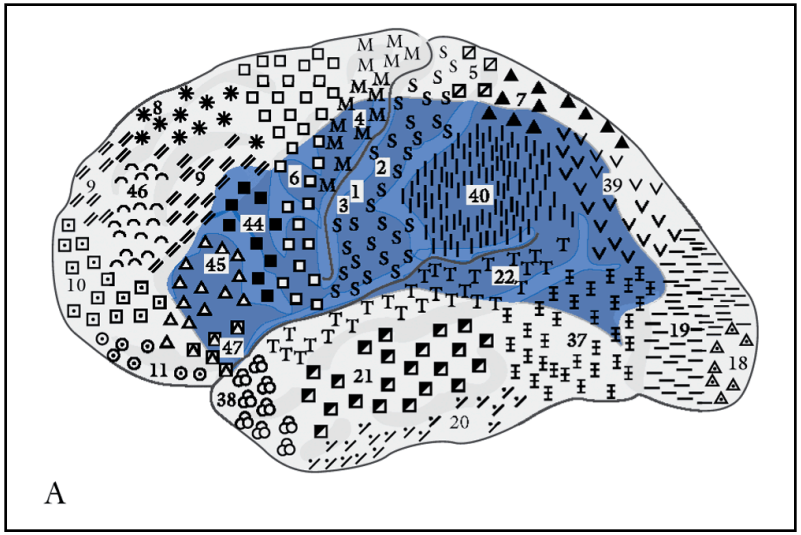


"What is this object called?"

"I know what it does…You use it to anchor a ship"

Global Aphasia

- Associated with extensive left hemisphere damage
- Deficits in comprehension and production of language



Summary of Symptoms

Disorders of Comprehension

- Poor auditory comprehension
- Poor visual comprehension

Disorders of Production

- Poor articulation
- Word-finding deficit (anomia)
- Unintended words of phrases (paraphasia)
- Loss of grammar or syntax
- Inability to repeat aurally presented material
- Low verbal fluency
- Inability to write (agraphia)
- Loss of tone in voice (aprosidia)

The basis of benson & geschwind classification

Three Main Steps:

1. The presence or absence of *repetition* disturbance.

2. Whether the aphasia is anterior or posterior.

3. Identifying disturbances limited to a single language modality.

Anterior	Posterior
Good retention of comprehension	**Marked affection** of comprehension
Marked difficulty of: Naming Reading Writing	**Less degrees of affection** of: Naming Reading Writing

Anterior	Posterior
Spontaneous Speech •Sparse output (usually less than 50 words/min, often 3-12 words/min) •Difficult initiation of speech •Poor pronunciation •Severe dysprosody •No paraphasia	**Spontaneous Speech** •Abnormal or high output (100-200 words/min) •Easy initiation of speech •Normal pronunciation •Normal prosody •Often with paraphasia

Anterior	Posterior
Spontaneous Speech •Short phrase length (1-2 words phrases) •No logorrhea •The anterior aphasic responds by a single word which carries a great deal of meaning but lacking grammer = Telegraphic Speech (e.g. noun, action verbs).	**Spontaneous Speech** •Phrase length above 3 words (up to 8-10 words/phrase oftenly) •Logorrhea in some cases •The posterior aphasic uses many words but fails to convey a full message (circumlocations, more grammatical & filler words)

Transcortical Motor Aphasia	Transcortical Sensory Aphasia	Anomic Aphasia	Isolation of Speech Area
•Doesn't speak unless spoken to •Attempt conversation	•Fluent •Word finding difficulty •Emptiness •Circumlocation •Paraphasias •Substitution	•Fluent •Word finding difficulty •Emptiness •Circumlocation •No paraphasias •Shortage of substitutive words	Echolalia
Comprehension sufficient for conversation	Abnormal limited comprehension	Normal comprehension	Failure of comprehension
•<u>Reading:</u> Slow difficult •<u>Writing:</u> Affected	•<u>Reading:</u> Impossible •<u>Writing:</u> Inable		Can't read or write
Repetition remarkably good	Normal repetition	Normal repetition	Excellent repetition

Transcortical Motor Aphasia	Transcortical Sensory Aphasia	Anomic Aphasia	Isolation of Speech Area
Association cortex of frontal lobe	Posterior border zone (Angular gyrus + Postero-inferior temporal lobe)	Less localizing	Involving border zone but sparing perisylvian area
•Vascular •Trauma •Tumor	•Vascular •Trauma •Tumor		•Carbon monoxide •Acute left ICA occlusion •Severe cerebral edema

SUMMARY

Type of Aphasia	Spontaneous speech	Paraphasias	Comprehension	Repetition	Naming
Broca's	Nonfluent	-	Good	Poor	Poor
Global	Nonfluent	-	Poor	Poor	Poor
Transcortical motor	Nonfluent	-	Good	Good	Poor
Wernicke's Aphasia	Fluent	+	Poor	Poor	Poor
Transcortical sensory	Fluent	+	Poor	Good	Poor
Conduction	Fluent	+	Good	Poor	Poor
Anomic	Fluent	+	Good	Good	Poor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THANK YOU