

Physiology of Language OR Speech



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Competency:

PY. 10.9 Physiological basis speech

SLO.

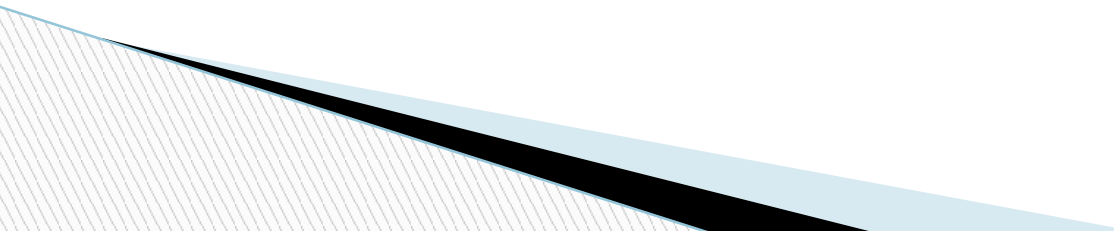
Introduction

Types

Brain area involved

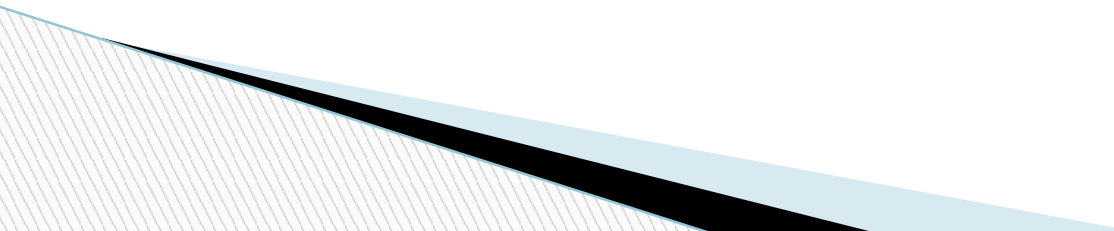
Neuronal Pathways

Applied aspect



“For millions of years mankind lived just like the animals. Then something happened which unleashed the power of our imagination, we learned to talk.”

Pink Floyd



Introduction

- ❑ One of the most important difference between human beings and lower animals is facility with which human beings can communicate with one another.
- ❑ Language is one of the fundamental bases of human intelligence.
- ❑ Human beings are also capable of expressing themselves through
 - work quality-work language
 - physical expression-body language
 - feelings- expressive language
- ❑ Generally language is means of communication of one's thoughts through spoken words or writing

There two aspect of communication

1-sensory aspect/receptive (language input)

2-motor aspect/expressive (language output)

Types of speech

1. spoken speech

2. written speech



Development of Language

Vary in rate and manner greatly

0-3 months : cries
-hunger, discomfort

3-6 months : smile
,sounds, vowels

6-10 months: first word
dada, mama, papa

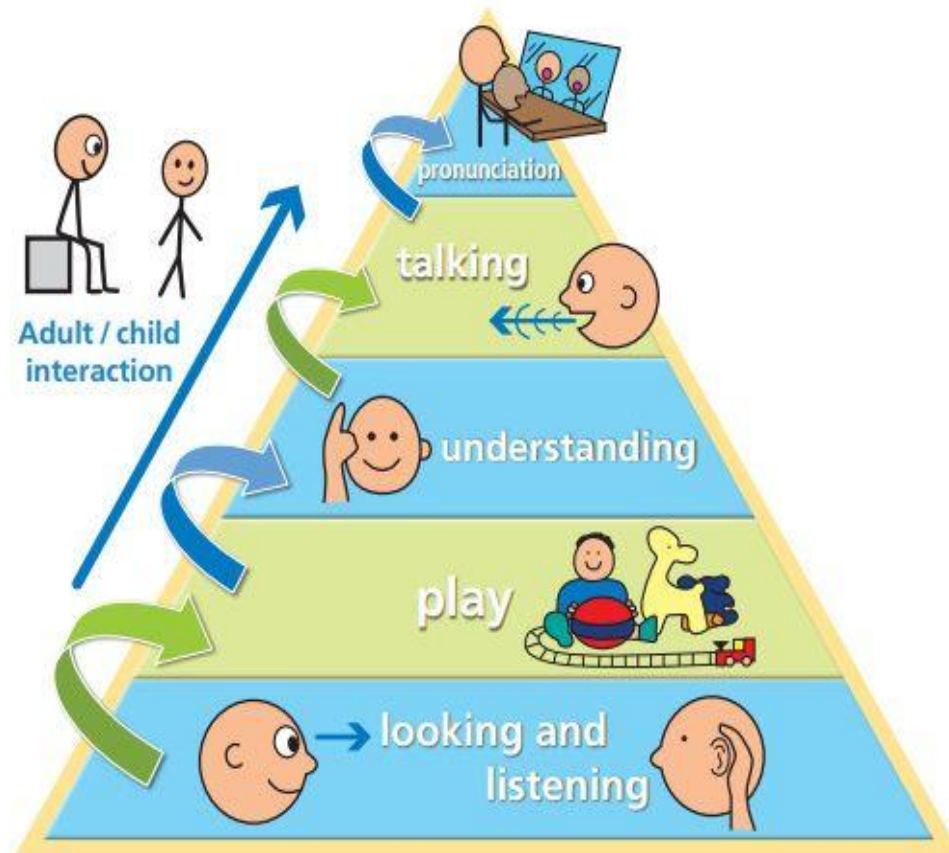
1 year :few words

1.5-2 year : one word
sent

2 year onwards :
vocabulary increases
rapidly

Language Development Pyramid

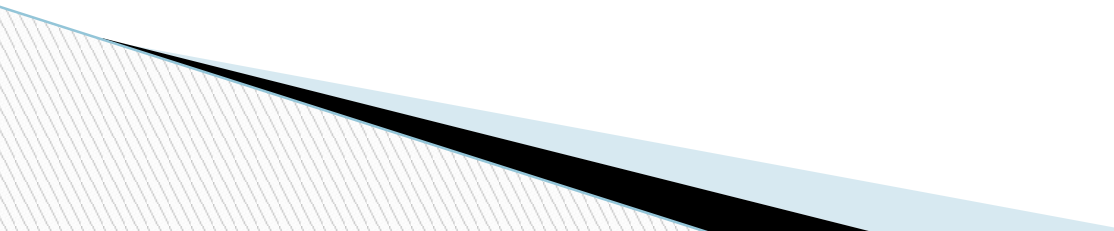
Skills at the bottom have to be in place before the skills above them can be developed



Brain areas

Brain areas concerned with language are present in the categorical hemisphere or dominant hemisphere.

In right handed person ,it is in the left hemisphere.



Brain areas

- Mainly four areas-Language zone
- Two area- receptive area
 - Wernicke's area(22)
 - angular gyrus(39)
 - Auditory area- Area 41 &42
- Two areas-expressive/executive
 - Broca's area
 - Exner's writing area

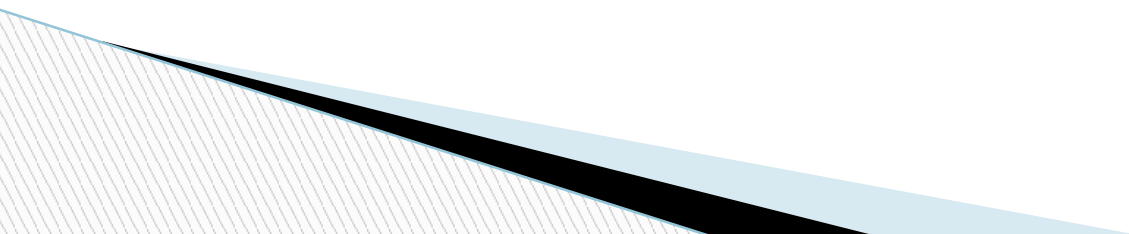
Arcuate Fasciculus –Connecting between two

Sensory aspect of speech

Input through

Hearing- auditory and auditory association area

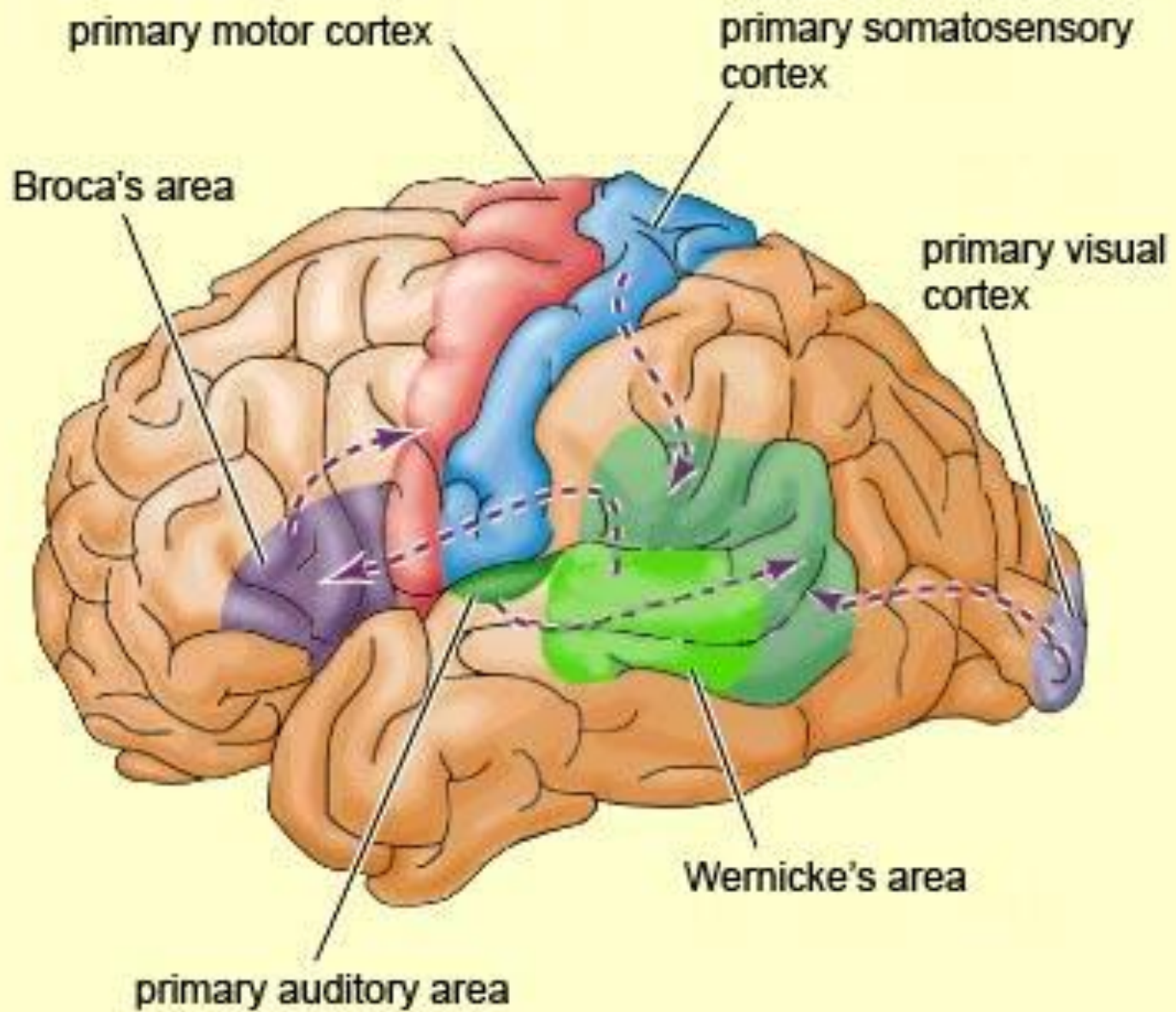
Visual(reading) – visual and visual association area

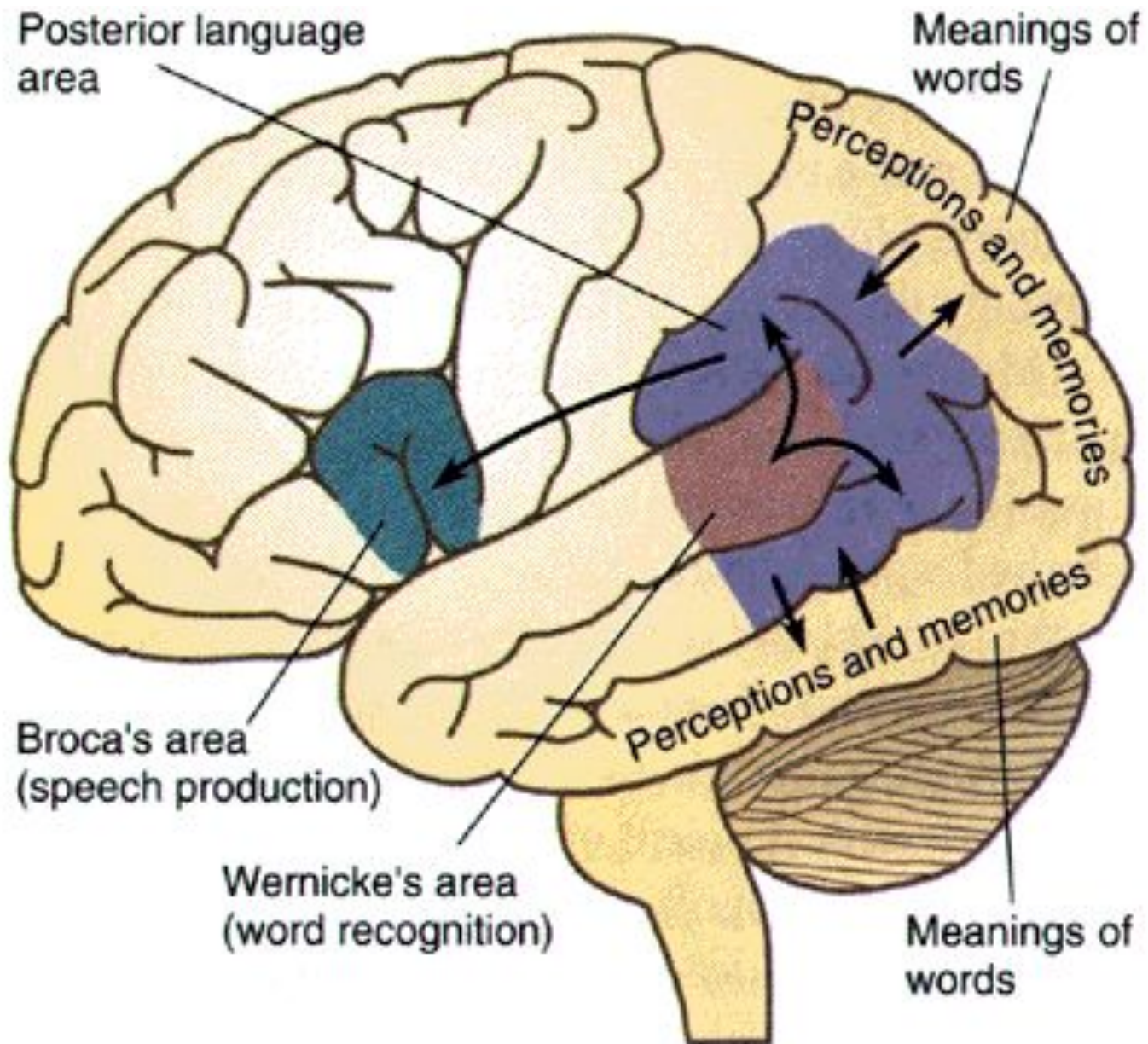


Interpretative area- **Wernicke's area (22)**
Named after Carl Wernicke in 1874

Located in upper part of temporal lobe –
parietal-temporal-occipital association area

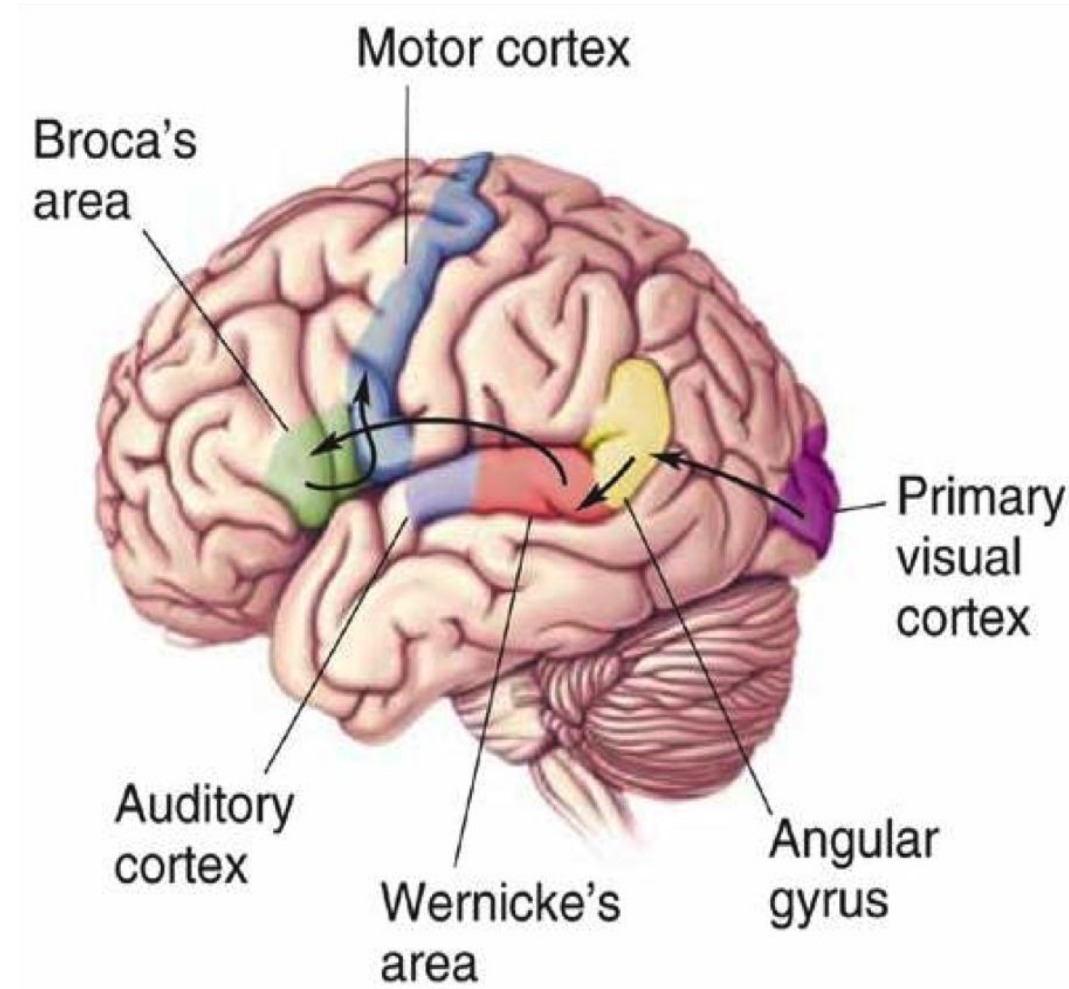
- **Major area for processing of sensory, somatic, visual, auditory information**
- Interpretation of the speech or thought
- understanding
- formation of thought
- choices of words
- appropriate sequence of words to express thought





▣ Angular gyrus(39)

- ▣ located in angular gyrus in inferior parietal lobule
- ▣ Sub serves perception of written language



Motor aspect of speech

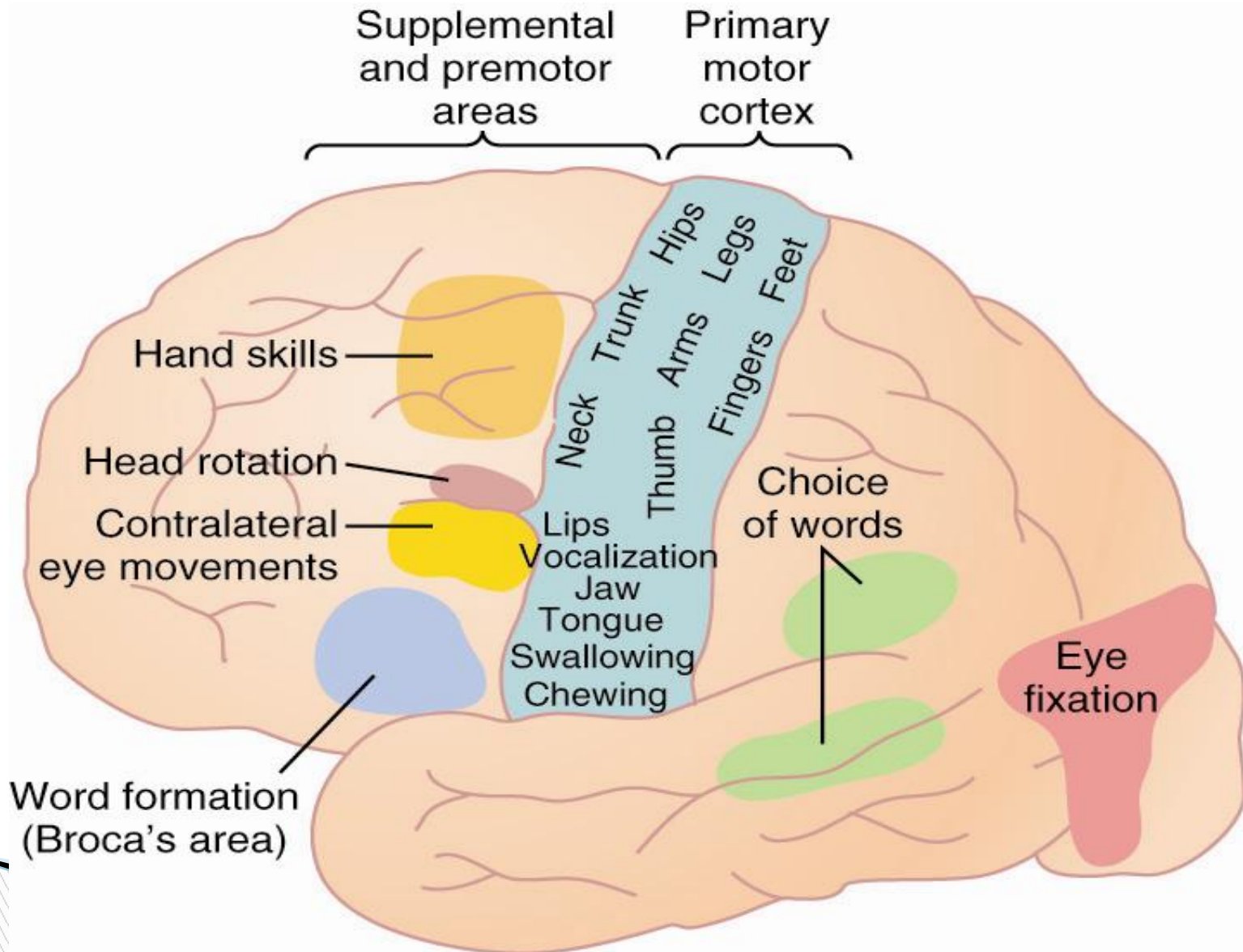
- formation of words
- motor vocalization of words

Motor area- Broca's area(44)

(word formation area)

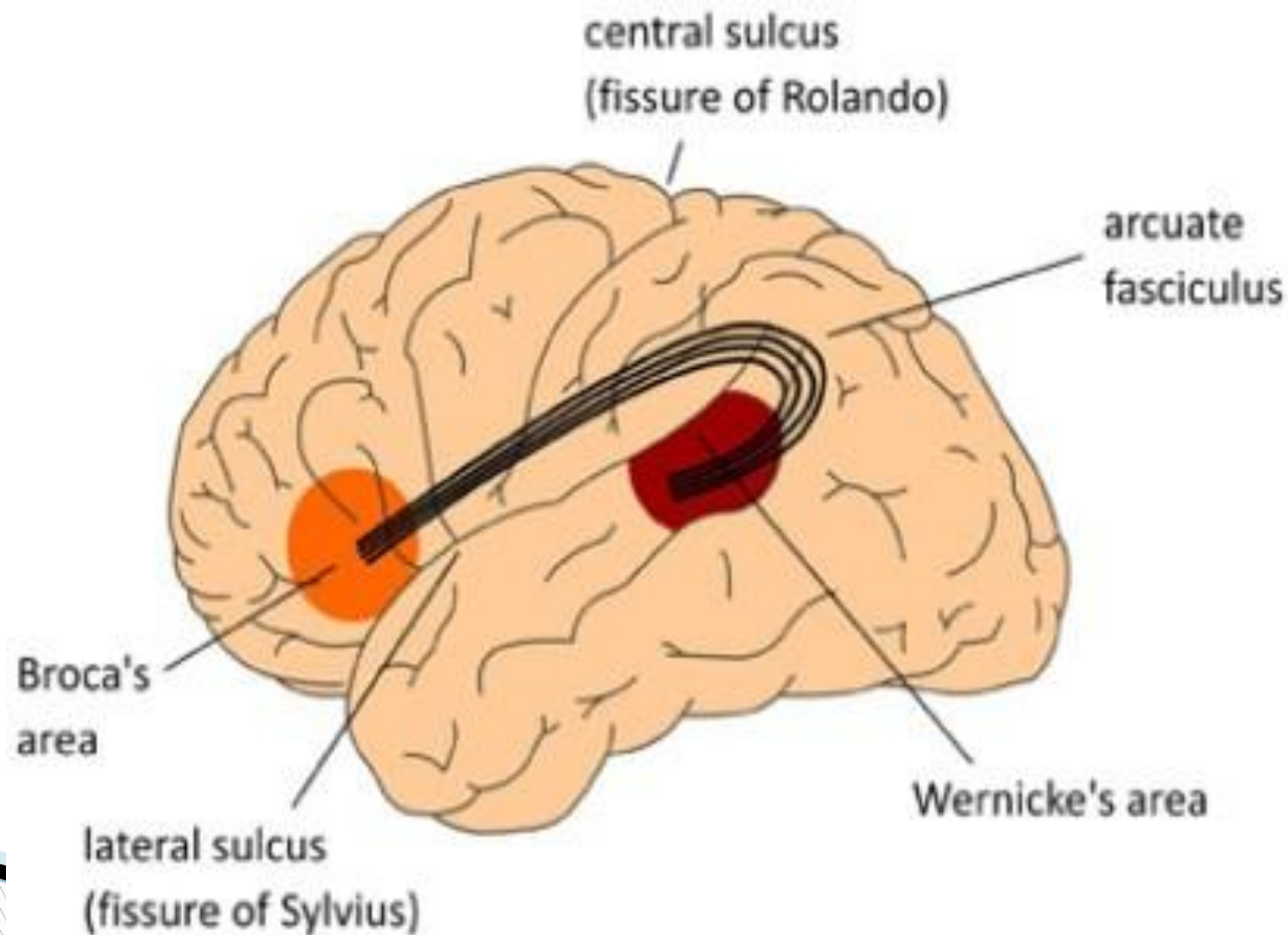
- process the information received from Wernicke's area into Skilled and Coordinated motor patterns for vocalization and project to speech articulation area for control of larynx, lips, mouth, respiratory system and other muscles of speech which initiates the movements.

Motor Areas



Arcuate Fasciculus

- ❖ Rich net work of nerve fibres
- ❖ Coordinates the understanding and execution of speech and language skills



Pathways for Auditory Communication

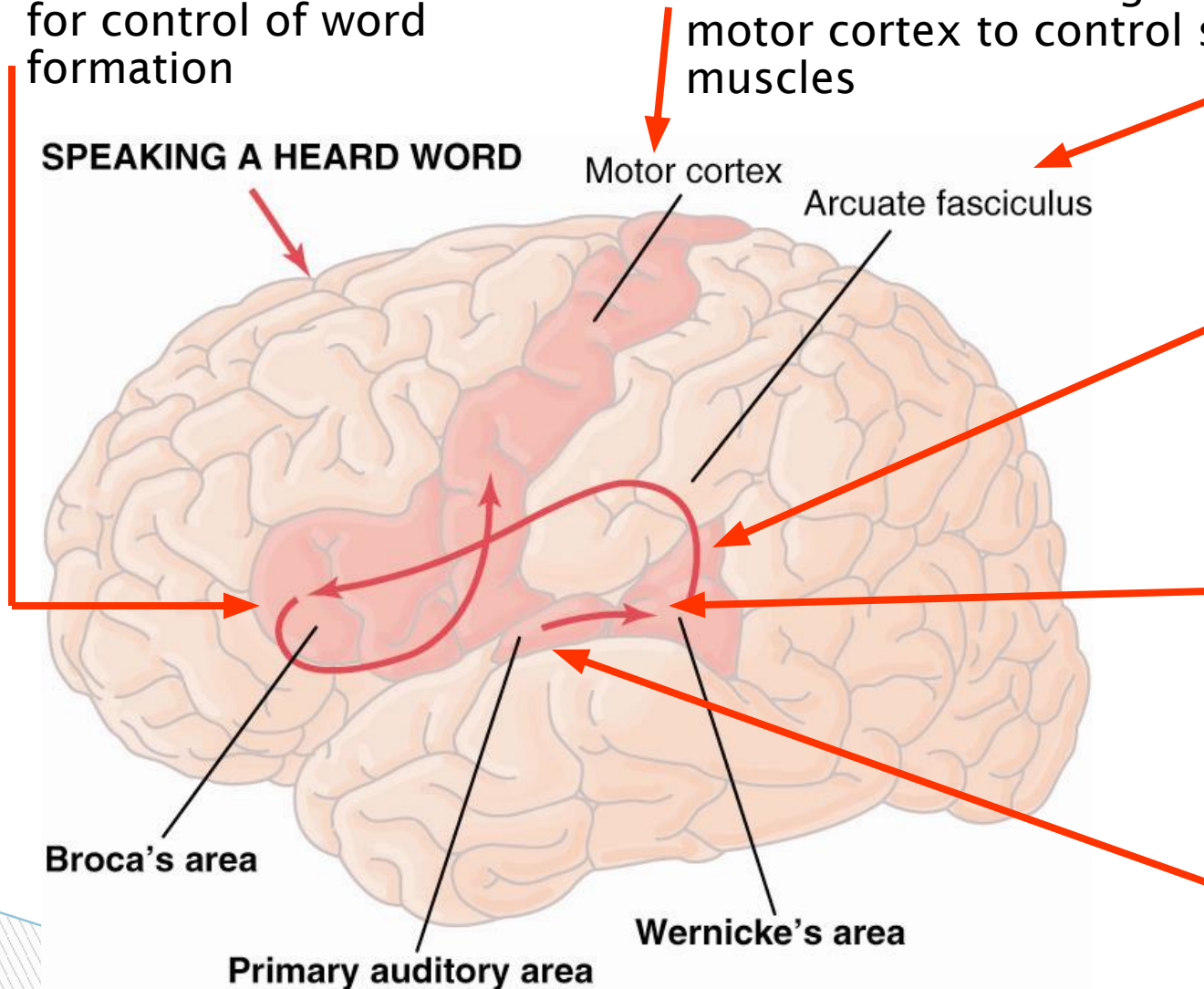
5. activation of motor programs in Broca's area for control of word formation

6. transmission of signals to motor cortex to control speech muscles

4. transmission via the arcuate fasciculus to Broca's area

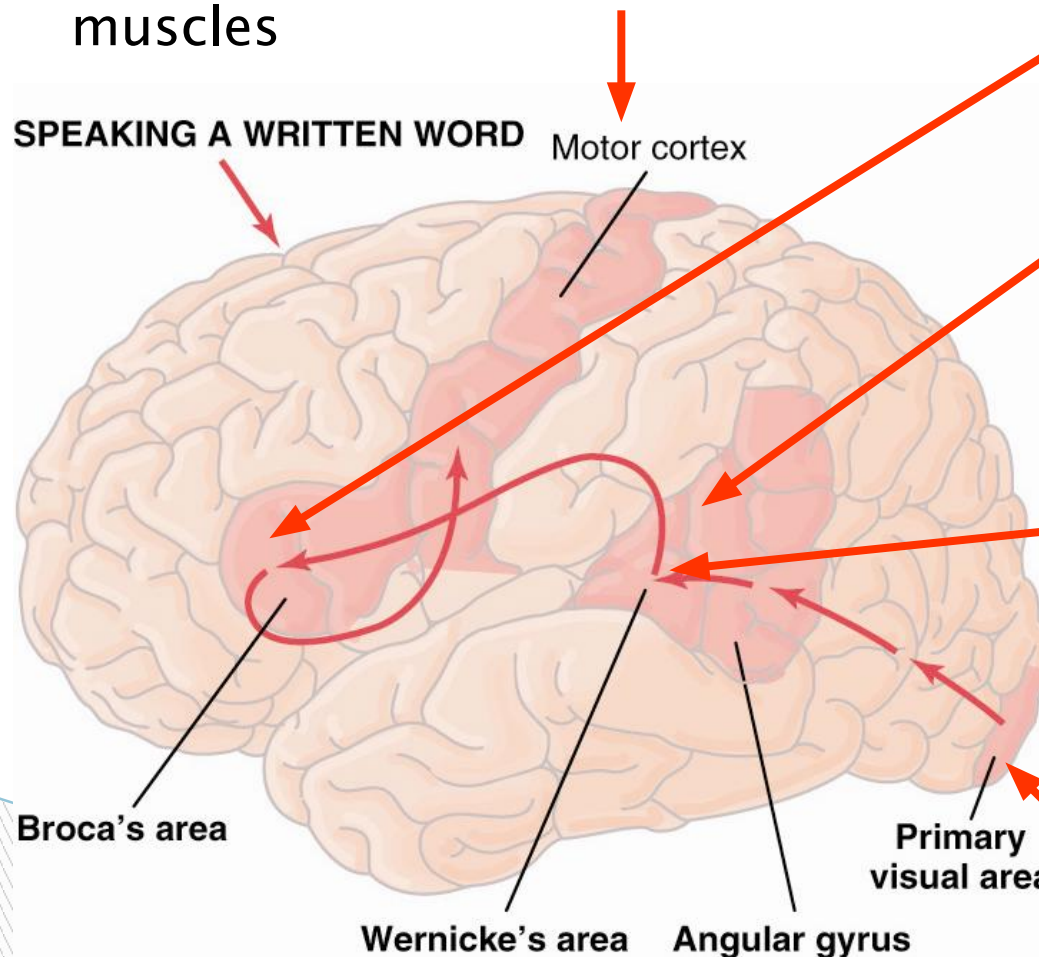
3. formation of the word that expresses a particular thought
2. interpretation of the word and the thought that the word expresses in Wernicke's area

1. primary auditory area recognition of the sound as a word



Pathways for Visual Communication

5. transmission of signals to motor cortex to control speech muscles



4. then to Broca's area for motor formation of the word

3. visual input reaches full level of interpretation in Wernicke's area

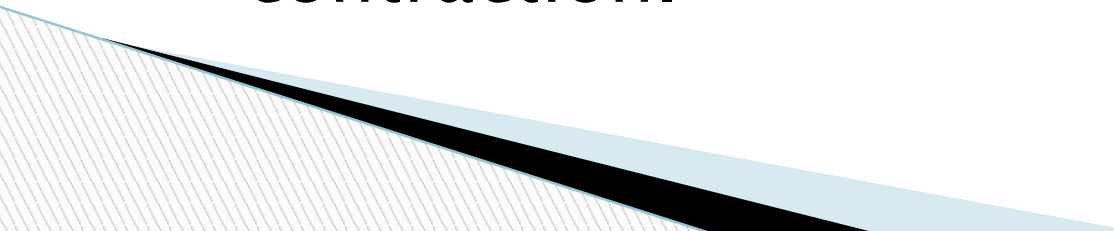
2. processing of the visual information in the parietal-temporal-occipital association cortex, the angular gyrus region

1. receive the visual input in primary visual area

Articulation

The act of articulation - muscular movements of the mouth larynx vocal cords and other parts responsible for intonation, timing, rapid changes in intensities of the sequential sounds.

Facial and laryngeal motor cortex activate these muscles and cerebellum, basal ganglia, sensory cortex all control the sequence and intensities of muscle contraction.



Applied Physiology

A-Sensory aphasia (Wernicke's Aphasia)

B-Motor aphasia (Broca's Aphasia)

C-Global aphasia

D-Dissociative language syndromes

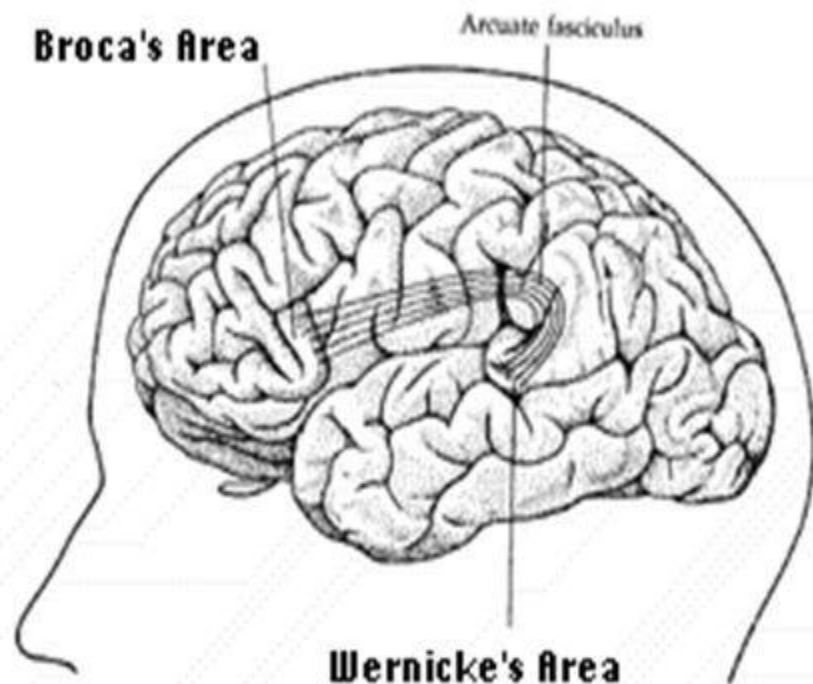
- conduction aphasia
- Word deafness
- word blindness (dyslexia)
- Pure word Mutism
- Anomic Aphasia
- Transcortical Aphasia

E-Disarticulation

Wernicke's aphasia

Damage to Wernicke's area results in:

- **Loss of meaningful messages**
 - But fluent and grammatical
 - paraphasias or inappropriate words
 - neologisms - invented words
- **language comprehension difficulty, especially with complex sentences**



Symptoms

- A person with Wernicke's aphasia will most likely:
- Reading is near impossible
- They do not understand what others say
- Poor comprehension of spoken and written language
- Speech is fluent, but has little or no meaning
- Difficulty repeating sentences accurately
- Speak in long, run-on sentences
- Speech tends to be at a fast rate, Include words that aren't needed or difficult to understand
- Include words that are made-up
- Unaware of their own language errors and disorganized speech patterns
- Articulation is normal
- Word finding problems are common

Short samples of Wernicke's aphasia

- Clinician: “Tell me where you live.”
- Patient: “Well, it’s a meender place and it has two ... two of them. For dreaming and pinding after supper. And up and down. Four of down and three of up ...” (Brookshire 2003:155)
- Clinician: “What’s the weather like today?”
- Patient: “Fully under the jimjam and on the altigrabber.” (Brookshire 2003:155)
- What is broken? What is preserved?

Broca's Aphasia

- Damage to broca's area
- **Broca's aphasia (non fluent aphasia)** = Trouble with speech production, speech consists of very short and simple sentences, mainly verbs and nouns
- Reading and writing not **as** effected (can be in some cases though)
- Deaf people can sometimes have difficulty signing if broca's effected. Although this depends on whether they were deaf from birth.....

Sample speech: Broca's aphasia

- Examiner: Tell me, what did you do before you retired?
- Aphasic: Uh, uh, uh, pub, par, partender, no.
- Examiner: Carpenter?
- Aphasic: (Nodding to signal yes)
Carpenter, tuh, tuh, twenty year.



Global Aphasia

- Sum of Broca's & Wernicke's aphasia.
- Typically the result of a large blockage of the middle cerebral artery.
- Signs/symptoms –
 - Typically nonfluent or mute & exhibit impaired comprehension
 - All language aspects (speech, naming, comprehension, repetition, reading & writing) are severely impaired.

Conduction Aphasia

- Information about word sounds is carried via the arcuate fasciculus
 - Connects Wernicke's area with Broca's area
- Damage to the fasciculus produces **conduction aphasia**:
 - Fluent, meaningful speech
 - Good word comprehension
 - Difficulty in repeating words

Aphasia (chair is shown)

1. Non -fluent (Broca's area)- 'tssair'
2. Fluent (Wernicke's area) – stool, chooss,
3. Arcuate fasciculus (conduction aphasia)- flair,
no swair, no no tair
4. Anomic (angular gyrus) – I know that..... ,
it is I have in my home