Physiology of Speech & Language

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Recommended Videos!

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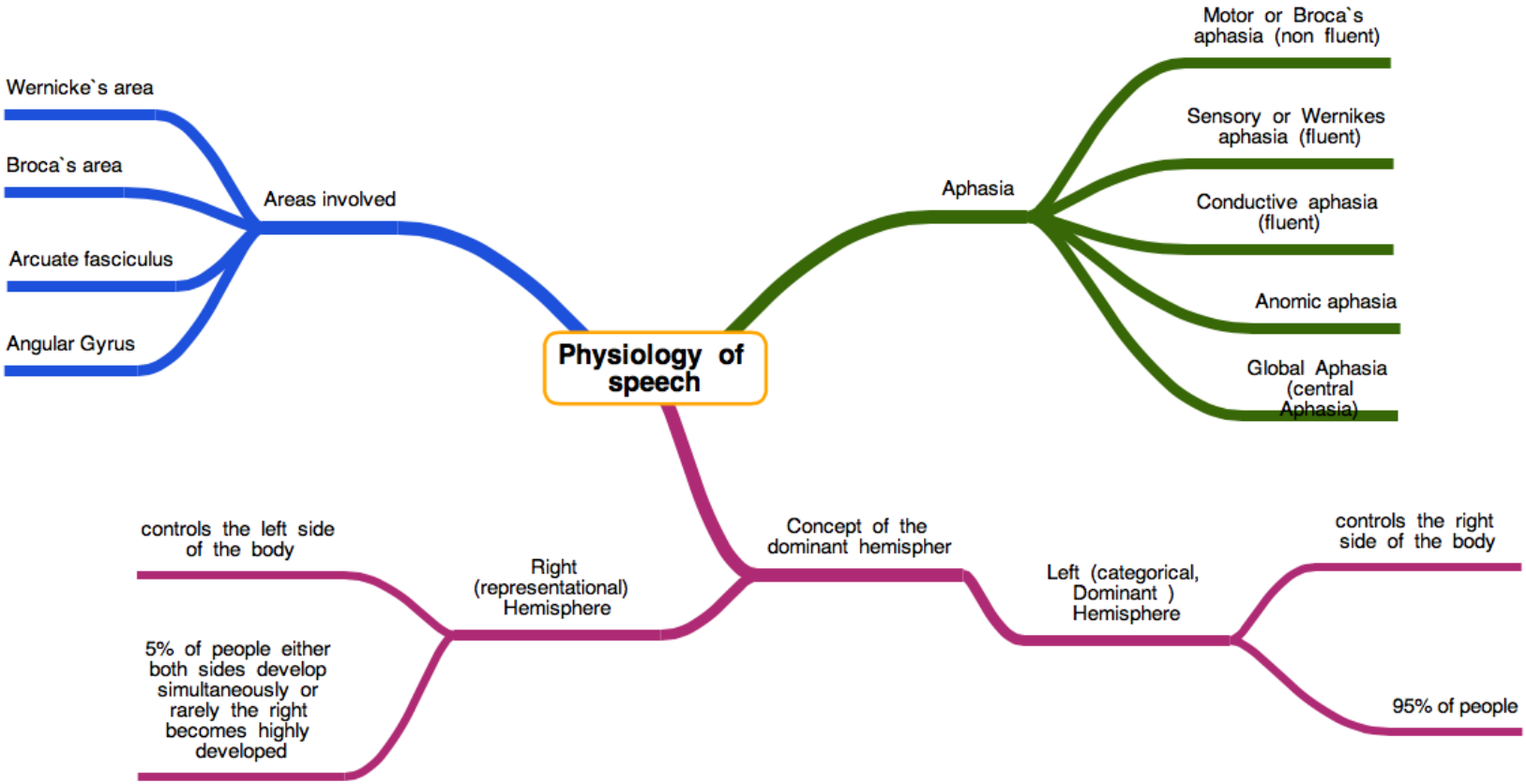
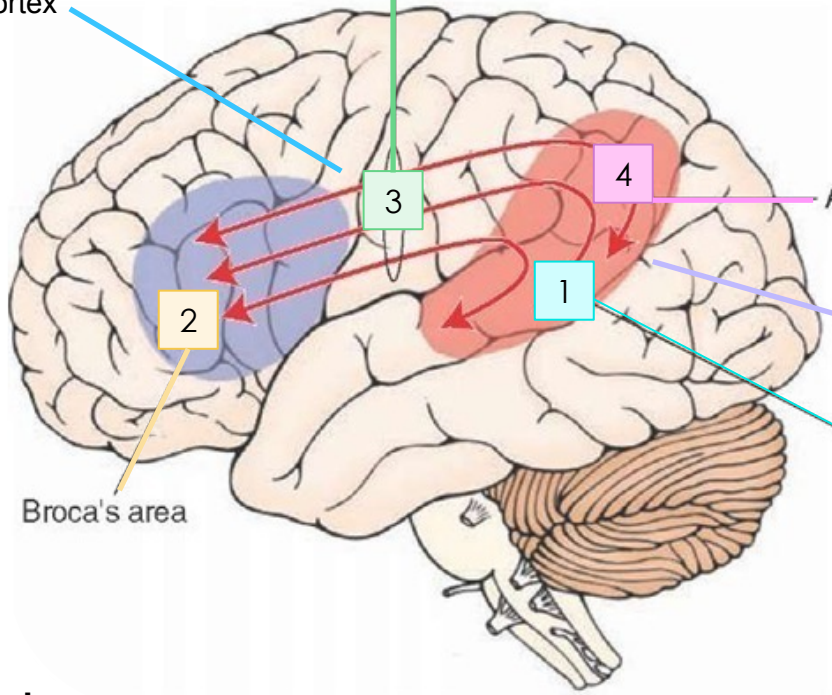
Please check out this link before viewing the file to know if there are any additions/changes or corrections. The same link will be used for all of our work Physiology Edit


Physiology of speech
Areas involved
Wernicke`s area
Broca`s area
Arcuate fasciculus
Angular Gyrus
Aphasia
Motor or Broca`s aphasia (non fluent)
Sensory or Wernikes aphasia (fluent)
Conductive aphasia (fluent)
Anomic aphasia
Global Aphasia (central Aphasia)
Concept of the dominant hemispher
Right (representational) Hemisphere
controls the left side of the body
5% of people either both sides develop simultaneously or rarely the right becomes highly developed
Left (categorical, Dominant) Hemisphere
controls the right side of the body
95% of people

Mind Map



Definition of speech :

- It is the ability to express ideas in speech & writing
- Involves understanding of spoken & printed words
- It is the highest function of the nervous system

Brain Areas Involved in Language

Area	Location	Function
1 **Wernicke's Area** (Brodmann's area 22)	•At the posterior end of the **superior gyrus** of the **temporal lobe** •Closely associated with 1 & 2 auditory areas	•**Comprehension**[1] of auditory & visual information, then project it to Broca's area via Arcuate fasciculus. •Interpretations[2] of **sensory experience.** •Formation of **thought** in response to sensory experience. •**Choice of words** to express thoughts.
2 **Broca's Area** (Brodmann's area 44 & 45)	At the lower end of **premotor area in frontal lobe**	•Process information received from Wernicke's area . area into **detailed & co-ordinated** pattern for vocalization[3]. •Then project it to **motor cortex** to Initiate the appropriate **movement of muscle of speech** in tongue, larynx & lips.
3 **Arcuate fasciculus**	Bundle of axons connecting Wernicke's area with Broca's area	**Conduction** between the two areas.
4 **Angular Gyrus** (Brodmann's area 39)	Leis **behind Wernike's area** fused posteriorly into the visual cortex of occipital lobe	Interpretation of information obtained from **reading from visual cortex.**

1: فهم. 2: The action of explaining the meaning of something. 3: نطق/ لفظ.

Auditory Area

Visual Area

Angular Gyrus

Wernicke's Area

Arcuate Fasciculus

Broca's Area

Hand Skills Area

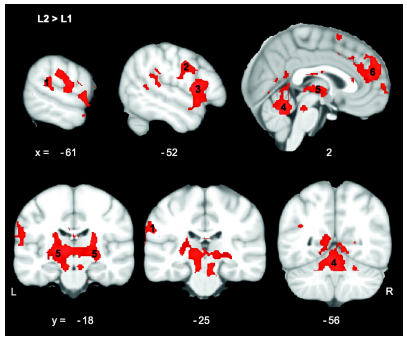
•If writing is concerned, then information received from Wernicke's area is processed in the **area of hand skills**

➔Coordinated pattern of muscle movement projected to the **arms & hand region of the motor cortex**

➔Initiation of necessary **muscle movement** in the hand & arms required for **writing** a particular word

•In **adult** who learn second language during adulthood. The MRI shows portion of Broca's area concerned with it is adjacent to but **separate** from area concerned with the native language

•But in **children** who learn second language early in life there is only **single area** involved for both languages



Aphasia

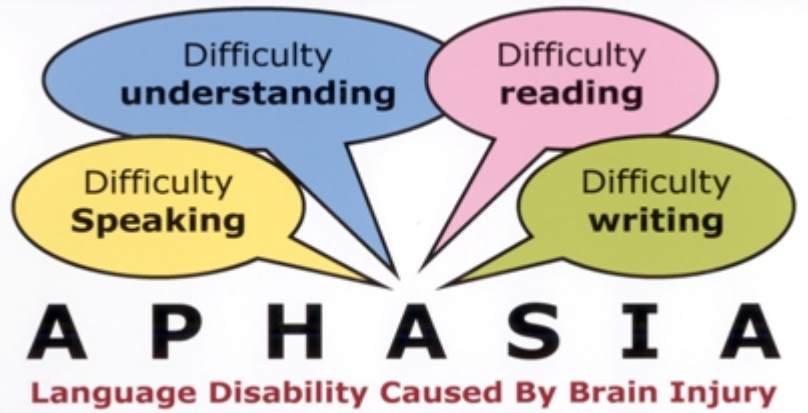
Abnormality of language function due to **injury of language center** in cerebral cortex, Comprehension or expression of words will be affected.

Result from damage to the speech centers within the left hemisphere.

✧Causes:

Due to Thrombus or embolism of cerebral vessels, trauma, brain tumors, or from infections.

✧**Dysarthria :** difficulty in **articulating** words by impairment of the muscles used in speech (**slurred speech**) and language centres are normal.



Types of Aphasia

Type	Motor or Broca's (Non-Fluent)	Sensory or Wernikes (Fluent)	Conductive (Fluent)	Anomic Aphasia	Global (Central) Aphasia
Location of lesion	Broca's area	Wernikes area +/- arcuate fasucul	Neve fibers of arcuate fasiculus	Angular gyrus B & W area intact	Broca's and Wernicke's aphasia
Response	•Understand spoken & written words but difficult to speech or to write. •Poorly articulated speech, slow with great effort & abnormal rhythm.	•Impaired comprehension •Loss of intellectual function. •Failure to interprets meaning of written or spoken words.	Patient understand speech of others but can not repeat it → because it won't reach Broca's area as it is due to the damaged arcuate fasciculus	Speech and auditory comprehension normal but the **visual is abnormal** The visual info is not processed & not transmitted to W. area	Combination of the expressive problems of Broca's aphasia and the loss of comprehension of Wernicke's
Speech	Speech may be limited to 2-3 words Broca's aphasia = broken speech	Meaningless & excessive talk (in severe cases)	Meaningless speech	Dyslexia (word blindness) interruption in the flow of visual input into W. area	Can't either speak & understand language

TO SEE HOW DO PATIENTS IN EACH TYPE REALLY LOOK LIKE, CHECK OUT THESE VIDEOS

1:02 min

1:05 min

The Concept of Dominant Hemisphere

Left hemisphere is usually dominant with respect to language, even in left handed people.

Right Hemisphere (the representational hemisphere)	**Left Hemisphere (the categorical hemisphere)**
Controls the **left** side of the body	Controls the **right** side of the body
5% of people either both sides develop simultaneously or rarely the right becomes highly developed.	95% of people
- Temporal and spatial relationships. - Analyzing nonverbal information. - Communicating emotion. - Recognition of emotion. - Recognition of tunes, rhythms. - Holistic problem solving.	- Produce, understand and manipulate language : recognition, use, and understanding of words and symbols - Speech - Identification of objects by name - Mathematics, logic, analysis

1- Which area responsible for interpretation of sensory experience ?
A. Broca's area
B. Visual cortex
C. Wenicke's area
D. Agular gyrus

2- The sensory information received from W. area and project to B. area via ?
A. Agular gyrus
B. Arcuat fasiculus
C. Arcuat fibers
D. Non of the above

3- Initiation of movement of muscles in the hand & arms required for writing a particular word ?
A. Hand skills area
B. Motor cortex
C. Arcuat fasiculus
D. Agular area

4- Patient will understand spoken & written words but find it difficult to speech or to write:
A. Non fluent aphasia
B. Sensory aphasia
C. Conductive aphasia
D. Fluent aphasia

5- Recognition of emotion in ?
A. Right hemisphere
B. Left hemisphere
C. Both
D. Cerebellum

6- Interruption in the flow of the visual process into w.area from visual area ?
A. Sensory aphasia
B. Non fluent aphasia
C. Dyslexia
D. Conductive aphasia

7- Produce and understand language by ?
A. Right hemisphere
B. Left hemisphere
C. Both
D. Cerebellum

8- location of Agular Gyrus ?
A. In front of wernikes area
B. Leis behind Broca's area
C. Leis behind Wernikes area
D. At the lower end of premotor area

1.C
2.B
3.A
4.A
5.A
6.C
7.B
8.C

MCQs

1- List two brain areas involved in language and define their functions ?

- **Wernicke's area :** comprehension of auditory & visual information
- **Arcuate fasciculus** : Conduction
- **Broca's area:** Process information received from W. area into detailed & co-ordinated pattern
- **Angular Gyrus** : interpretation of information obtained from reading from visual cortex

2-Witch type of aphasia has abnormal visual comprehension ?

Anomic aphasia.

3- Where is Wernicke's area located?

At the posterior end of the superior gyrus of the temporal lobe.

4- Which area is effected in motor aphasia?

Broca`s area.

5- What is the function of motor cortex ?

To Initiate the appropriate movement of muscle of speech in tongue, larynx & lips.

6- What do we call the bundle of axons connecting the Wernicke's area to the Broca's area?

Arcuate fasciculus.

THANK YOU FOR CHECKING OUR WORK!

BEST OF LUCK

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