In the lower part of the temporal lobe and occipital lobe . (The inferior surface reaches the lower part and lower medial part), here the processing of the visual information takes place (what is the object, what is the pattern of it and the recognition of the color )

And when we see an object we don't want to know its pattern only, we want to determine if it moves or not, where does it move, the speed of its movement, its place and where it will be after for example 2 minutes (motion , movement and place, not only object recognition that goes to the inferior part ) ….. **AND we want all these things to be processed and remembered.**

There are 2 pathways of the vision:

1-ventral… "What pathway"…"object recognition"

2-dorsal… "Where pathway"…"object motion ,how it moves ,its speed and direction "

\*\*in the vision we care about "where pathway", the vision takes from what but mainly and more from where.

so we have another part of processing of vision which is "where pathway" which is the dorsal stream passing from the occipital going up to the superior part of the brain on the parietal (the superior part of the occipital and parietal).

so the vision on the occipital, the ventral pathway will go to the inferior of the temporal and medial of the occipital and temporal and there we will analyze "what" which determines the color, shape and the category and what the thing is exactly. and information of its place, movement, speed and its direction in the "where pathway" in the dorsal stream on the paraietal and the superior part of the brain.

**The doctor mentioned the previous underlined in section 2 but I didn't hear it in the record.**

 \*\*if there is damage on "what pathway" then there will be: object agnosia , color agnosia, specific object agnosia, specific category or face agnosia which called prosopagnosia.

\*\*if there is a damage in "where pathway" then we will see the object moving but we will **not** be able to determine the power of movement,the degree of movement or its place.

1- spatial relationship distortion, EXAMPLES :

\*I see the glass in certain place and pour in another place.

\*I know everything that exist, but I don't know things related to each other "I can't distinguish between them"

 People with spatial relationship distortion can't use a map and they can't know the relation between places.

2- Achino toxia…" I see fragments of time (I see 1 second then lack 2 seconds then I see 1 second…etc, can't see step by step) , I can see the motion but the processing is damaged".

 **An example of this** : is when a person want to fill a glass but he can't determine when it's full so he will over fill it and the juice will spill out of the glass

Attention is in the parietal lobe , and we know that the attention should be targeted toward a specific thing, but if I don't know where is this thing exist and I took the information from the vision then I won't be able to make attention for it.

**P.S** : where pathway ends with attention then they overlap with each other .

\*Back to parietal lobe (which is responsible for time , sequence , attention, calculations and space).

\*The one that is responsible for time is also found in the temporal lobe , that's why we don't know exactly its location –some peoples say it's mainly in the temporal( in the lateral side) , others say mainly in0 parietal – but as attention takes multi things also the time may be in more than one place " in both temporal and parietal" .

\*\*We have already said that 1,2,3 are mainly sensory,

 5,7 are the end of where and the beginning of attention part.

43,40,39 differ from place to another

\*We said that the Right hemisphere is more involved with attention.

\*Now we will talk about space , calculations and sequence :

 -The two hemispheres are ALMOST identical , but there is a difference in function , and sometimes they are anatomically different .

-Right hemisphere control motor and sensations from the left side of the body .

-Left hemisphere control motor and sensations from the right side of the body .

-we already mentioned in previous lectures the vision is divided according to the visual field.

-Higher functions such as language and attention , sometimes one side control more than the other side…for example attention mainly in the right and calculatiom mainly in the left.

**---IN GENERAL , we can say** :

- Left hemisphere is more responsible for logic, math, numbers, language, reading and calculations , to process complex information and analyze problems .

- Right hemisphere is more responsible for music , art , color , emotions and religion .

\*\*BUT this does NOT mean that only the left do these functions " language , logic …" or that the right only that process "music , art …"

We mean the the left is more active (more involved , more process) in "language, logic …" , and right is more active in "music , art …".

Anatomically , the area that is responsible for language in left is more developed , bigger and more complicated the in the right .

-The function that we do daily such as motor, language, logic, we do them more than do art, music and religion so they said that the left side is the dominant hemisphere. But the doctor said that he is completely against because person who is interested more in art and music … Why the left side is the dominant .

 -The attention mainly in right side and language,calculation in left side,

This applies 100% in right handed And 90-95% in left handed , **SO** those 90-95% have language and calculations on the left and the music and attention on the right.

- We said that right hemisphere is more involved with attention , that will leave the left hemisphere with a large area for other certain functions , that's why left hemisphere ( left parietal) which is more involved in calculation , logic … ,and it is more involved in preorder for motor . Premotor area (no.6) , in the frontal lobe is responsible for motor .

Because the attention is more on the right, the left side has more space to perform other functions. We have a language center in the right parietal lobe but it is more functional in the left and so more dedicated to writing because the language participates here as well. We said that the premotor is responsible for thinking for the parietal lobe. We cannot imagine something we haven’t seen before. The premotor cortex takes some information from the visual and the parietal, because the parietal will give the logic and planning step by step. The premotor cortex will also take some information from the multi sensory area (Parietal lobe.)

Normally, in a right handed person the motor area will be bigger and more developed in the left hemisphere [both the primary and the premotor cortex located in the left parietal lobe].

This does not mean that we have no motor area in the right parietal, it is present but not as developed

Since most people are right handed, they use the left lobe more for writing, Sometimes if they lost the left lobe, they have mild apraxia losing the motor area 6, leaving more space for the calculation and language centers, becoming better in mathematical calculations.

The motor area for the left handed has been developed more in the right parietal lobe, However, the development of the motor area in the right parietal lobe will leave less space for attention; they’ll have low attention span... Which is not a good thing, since that every movement will catch the person’s attention, losing their concentration. (Biggest example is Dr. Loai losing concentration when a person talks.)

*[Right handed: Use calculation and language and motor in the left parietal,,, Left handed: Use calculations and language on the left parietal lobe while the motor from the right parietal lobe.]*

*~This is what happens to the motor area in the* ***left parietal lobe in a left handed person****. Due to the underdevelopment of the motor area, the other areas will have more room and thus; it is believed that left handed people have greater ability for language, logic and calculations due to the more capacity they hold.*

*\*Notice here that the size of the motor area is larger than the language area in the* ***left parietal lobe. Normal right handed person.***

Be careful though, we did not change lobe for anything, we just have a development switch. Motor area is still present in the left lobe but underdeveloped. Neither attention nor language area had moved. They stayed in their right place, just differing in development leading to different functional capacity.

\*\*\*Most left handed people are bihanded. And a lot are bilanguage (use language center on the right and left lobe).

\*90% of left handed have only one change, the motor area being more developed in the right area, Not everything will be switched between right and left hemispheres due to the motor area being switched. [Left handed is actually a disorder].

-If there is some more switching, some may face language problems.

**Factors of left handed**:

- It could happen by accustoms but it's the least probability.

-Genetically, it could be the brain arrangement running down in the family.

-Trauma may have caused problems in the left motor, leaving the right motor area no choice but to take the functional role.

Left handed people 90% just motor area will DIFFERENT without any difference on other areas .

* We said Most left handed people are bihanded that mean they can use both hands also language will be bihanded,, especially those having switching in brain so they have problem in language and expression WITH other problems
* Ex. Right handed people<< left and right parietals will do collecting to the motor right hand << but left will be more because she use right more
* Recall that parietal lobe for attention and "where" also in the parietal.

If the damage happen at specific area on one parietal or both of them << damages will lead to **simultangosia** << patient with this damage won't see the whole picture, he just can see small parts of it and he can’t understand all the picture what it contains << referring to slide #17 which contain simple 2 quiz for this look at the right part from slide << as you can see this picture contain a groups of “T” letter that form together “H” letter BUT **simultangosia** patient will see just those “T” letter but not the whole "H" letter.

Referring to slide #17 at left part normal person should see or recognize at least these things << boy steals cookies from the jar and will fall from on the chair , mother Wash the dishes with overflow in “mjlaa “,,, but **simultangosia** patient will see just small part from the picture ( one or two events maximum) like that boy steals the cookies from the jar,, BUT he can't determine that he will fall.

\*\*\*We said that parietal is responsible for vision and it also helps us in motion ,especially motion guided by vision is from parietal, it will send the information to the premotor and take it back to the primary motor.

SO, people who have damage in parietal will have Optic ataxia.

**ATAXIA** **: loss of coordination of movement**.

Optic cerebellar ataxia: its source is from cerebellum.

Optic ataxia can't do coordination reach with optic information.

So, person with an optic ataxia will be able to handle everything and know objects and use them sometimes but not things guided by vision.

AND if we put a spot and told him to put his hand inside it He can't because he has damaged orientation /or the place of the spot is not clear.

-But the person who has cerebellum…. He will try once and twice until he get the target, because he has either : damaged attention or dysmetria.

NOW WE WILL TALK ABOUT **LANGUAGE**:

-The source and the beginning of language is the junction between parietotemporal and occipital medial.

-Language is a complex thing and complex behavior but it consists only of twp things (parts) :

1- Understand the language.

2- Execution of language.

And each one of them is a multi thing and multi sensory so each one of them is in an association.

1- understand the Language ------ the association is closer to the sensory and multisensory area.

2- execution of language ------the association is closer to the motor area.

**So**, we have two parts of language, we understand it and then we execute it by sending orders through white pattern and connections to the motor area.

\*\*the area that is really responsible for language is called broca's area but it varies a little from one person to another in size, distribution, and in the anatomy,,, there is another area called wernicke's area.

Wernicke's area --- understanding of language\*

Broca's area ---execution of language\*

\*\*\* If a damage has happened to the broca's area in the left hemisphere then there will be **Expressive aphasia (Braca's aphasia)** ,, we call it expressive because the person will not be able to make expression.

\*\*\*Language is not only speaking,it also includes motor, movement, pointing and writing.

\*\*THE STORY OF BROCA\*\*

A normal person had a stroke and he couldn't say anything, he went to a doctor who is specialized in neurology called BROCA ,, dr.broca had tried to treat the patient repeatedly but without a result, and the patient lived for 20 years later couldn't say anything except the word "tan" , so when this patient died,, Broca took his brain and saw the damaged area in the brain and said that it is the area responsible for language, another patients after that with the same problem and the same damaged area confirmed that this area is responsible for language.

 \*\*\*Complete broca aphasia: the stroke includes all the area and deeper structures in the INSULA lobe.

But not any person with broca's aphasia will be deeper like that, it varies depending on the stroke and damage,, also the recovery will depend on the damage..

\*For example; if the damage include half of the area, the another area will become differentiated.

\*\*One of the famous modern stories of Broca's aphasia is Sarah scott (19 year-old), had a small stroke in broca's area and she couldn't speak,, So stroke does not happen only to old people.

\*Stroke will affect not only speaking, but also writing and pointing even people who know sign language will lose it.

\*\*\*IF damage occurred on wernicke's area then we won't understand the language and this is called **wernicke's aphasia (Receptive aphasia)** .

Usually, normal person will take from vision multisensory, recognition of vision and speech then make processing and analyzing, then send order to the motor.

**Example:**

See the ketchup recognize it by vision it will go to the processing area and take from the memory of speech that this is a ketchup then send the order to wernicke's area.

\*\*But if the order didn't go in the right way then the person will say whatever, wrong words and any sounds.

-The same thing in repeating the words:

Normal person will hear the word processing send the order to wernicke's area for understanding then execution.

\*\*But in wernicke's aphasia, the patient will hear something and say something else.

**BUT;** if he heard and wanted to make an order, like someone asked him to handle something then he will handle it, but if he asked him to say something then he can't, in other words, he will follow the commands and the facial expression is good, but the problem is when he make language later.

A person with wernicke's aphasia also can't write except he was a writer and wanted to write a story then he can write it.

\*\*\*Broca and wernicke areas are present in the left hemisphere. But the opposite areas for them in the right hemisphere are almost identical with the left ones but every area is responsible for specific something ,,

\*example: there are areas for attention in the right and left hemispheres but the right is bigger and more responsible.

The same thing when we say about the lower frontal area of the left hemisphere which is Broca's area, there is another area resembles it anatomically present on the right hemisphere and is responsible for language also but it is smaller than the left one.

So, for language there are two areas on the left hemisphere and two areas on the right hemisphere, but the larger by anatomy are on the left, then what are the functions of the right hemisphere? … Art, music, religion and emotion.
so , music part of speech is present on the right hemisphere,, emotion part of speech is present on the right also,,

 We have already said that the language is a complex thing , you can conclude that the person is angry or not depending on the facial expression and the tone not the words themselves.

\*\*The tone is so importantbecause other languages such as English and Spanish depend on the tone more than depending on the words.

\*Right hemi. is responsible for music and tone, and is responsible for facial expressions more than the left hemi.

\*\*\*If the equivalent area for braca's area (which is the lower portion of frontal lobe) has gone from the right hemisphere what will happen?

The patient can't give tone with speaking, and the execution will be damaged, and he will be like newsman; read without facial expression and without tone.

AND if the equivalent area for wernicke's area (which is on the parietotemporal junction) has gone from the right hemisphere then the patient will not understand the music tone or the facial expression of the corresponding person,, and this called **prosody of speech**,, also he will be able to speak but without tone or meaning.

\*\*How can this person be treated\*\*??

By music language or music therapy by making all speech related to music.

\*We said that the right hemisphere is for music, and the left one is for language,, **BUT** hearing words or music will come for both hemispheres.

\*but when I hear someone talking with me, the left hemi. will be more activated than the right one (because the left hemisphere is more for speech) ,, the same thing when I hear music the right will be more activat*e*d

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