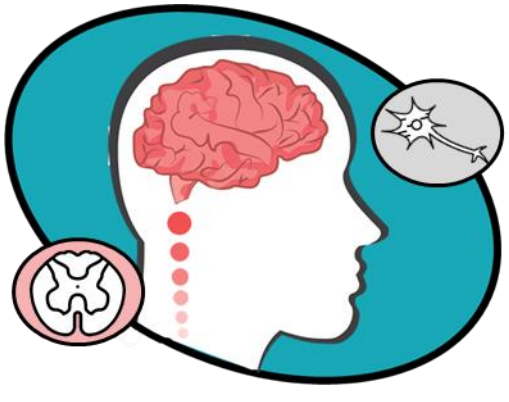


CNS

Physiology

Sheet Slide

Number

9

Done by:

Mahdi Sharawi

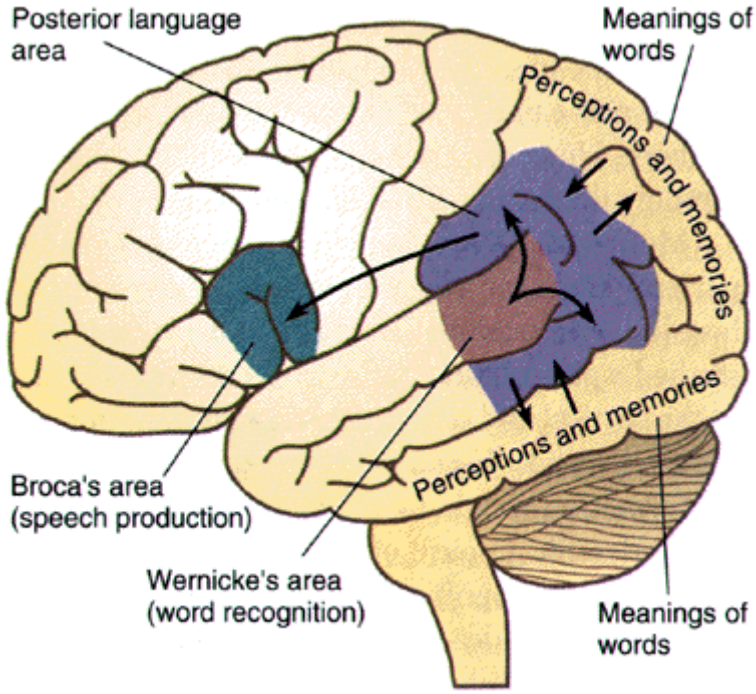
Corrected by:

- Amani Nofal

Doctor:

Dr.Loai

The doctor started talking about the language centres in the brain, the anterior language centre (Broca's) which is responsible for producing language, and the posterior centre (Wernicke's) which is responsible for receiving and understanding language, and that lesions in anterior centre will cause **Expressive aphasia (Broca's Aphasia)** and that the posterior part is the area that will receive and understand language, and also the production depends on the area that is associated with receiving because we studied that the posterior parietal area is responsible for analysis and ordering/sequencing of everything including the analysis and ordering of words. So, when broca's area decides to function it will have to receive the sequence and the analysis from the posterior areas. If there's a lesion in the posterior area, the sequence, grammar and analytical part of language will be affected, they will be able to produce language but this language doesn't have a proper sequence which is called **Receptive aphasia(Wernicke's aphasia)**.



Note: Area 22,39 and 40 which are called physiologically Association of language comprehension or understanding or receiving.

The doctor Played a Video from minute 2:10 till 4:20

https://www.youtube.com/watch?v=mxo0GDE6szs

Wernicke's patients who can express themselves unlike Broca who was unable to say anything other than "Tan" or asSara

(The girl in this videohttps://www.youtube.com/watch?v=1aplTvEQ6ew)

whowas able to say certain words but she sometimes couldn't say some words. This demonstrates that depending on the size of the lesion we can have different outcomes of deficits which might cause the patient to speak words but they're not well ordered, not understandable and not connected

So wernicke's aphasia patients, unlike broca's, when they hear something, the information will go in through primary and secondary auditory, their brain will attempt to translate the information received, since there's a lesion, their brain won't be able to understand the information.so they will speak with no regulation, there won't be anything to stop them if they say something wrong. (thewernicke's aphasia patients don't know if they say true or false)

We said that in that area there's the understanding and receptive part of language, so normally if there's damage in it the patient is supposed to be unable to understand language, Logically. However, patients will still maintain some degree of understanding**, semantic language understanding** because it's

processed in different part of the brain associated with the limbic system. So a lesion will cause general understanding deficit but maintain some degree of semantic understanding.

So speaking to a wernicke's aphasia patient has to be in short ,directand simple sentences for them to understand, speaking in complex, quick and metaphorical sentences won't be understandable to them.

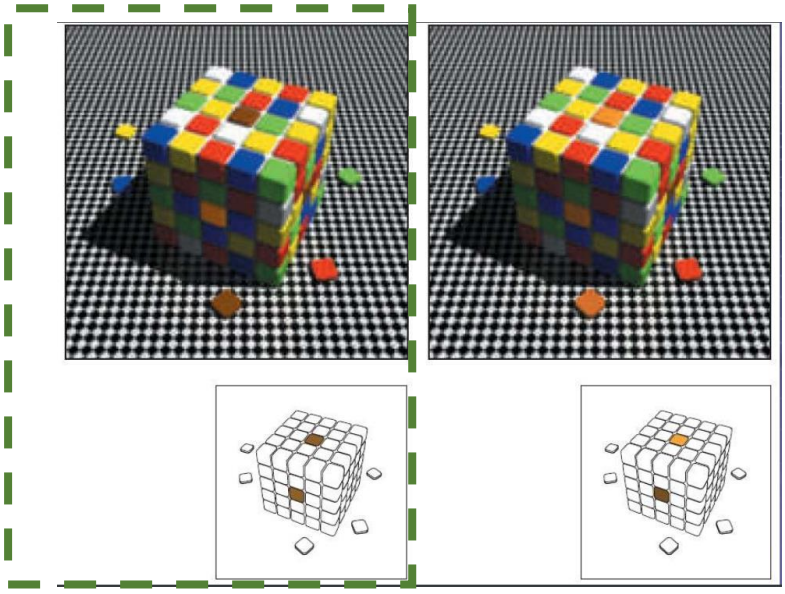
We have Area 39 and 40 on the right hemisphere and also on the left hemisphere, both have the same function, language association and receiving, and also we have area 44 and 45 on both sides which both function as association of language production, the **left** hemisphere areas are bigger due to the fact that language is mostly analytical which is more dominant on the left hemisphere, So broca is area 44 and 45 on the left hemisphere, 44 and 45 on the right hemisphere are not called broca's area. The left side is responsible for the functions we spoke about earlier, but the right side is more focused on the tone and the rhythm of the language which helps us determine if the speaker is asking, exclaiming or stating facts.

So in people who have right sided lesion will experience **Aprosodia** they won't be able to understand different tones of language. That's why the girl in the video was able to sing properly when asked to complete the song, because that mainly lies in the right hemisphere which was intact. And melody/tone therapy is used in people with aphasia and congenital speech problems to help them speak properly.

Note: Please keep in mind, the doctor emphasized, broca is area 44 and 45 on the left side, on the right side they are not called broca's, it is called association of language production area.

Now , let's talk about vision .

We can see different colours because there are 3 different type of cones with overlap amongst them, this overlap is the reason that humans can see more than 3 colours. However, colour processing mainly occurs in the cortex, retina helps detect them, but the cortex is mainly responsible in this function. For example, the cube that we saw had different colours just because the cortex decided they're different.



The normal human being can differentiate between 120 different colours, and with shapes we can say thousands.

Now if we have a defect in one of these proteins, the curves and their intersections will change, So the number of shapes we'll be able to detect will decrease. This is what we call **colour blindness**.

We have 3 cones contain 3 proteins, 2 of them on the X chromosome (more common to mutation happen), and one of them on a different chromosome (somatic)which is less common.

Now we can have a defect in one of these genes on the X chromosome, or even both of them, either through complete

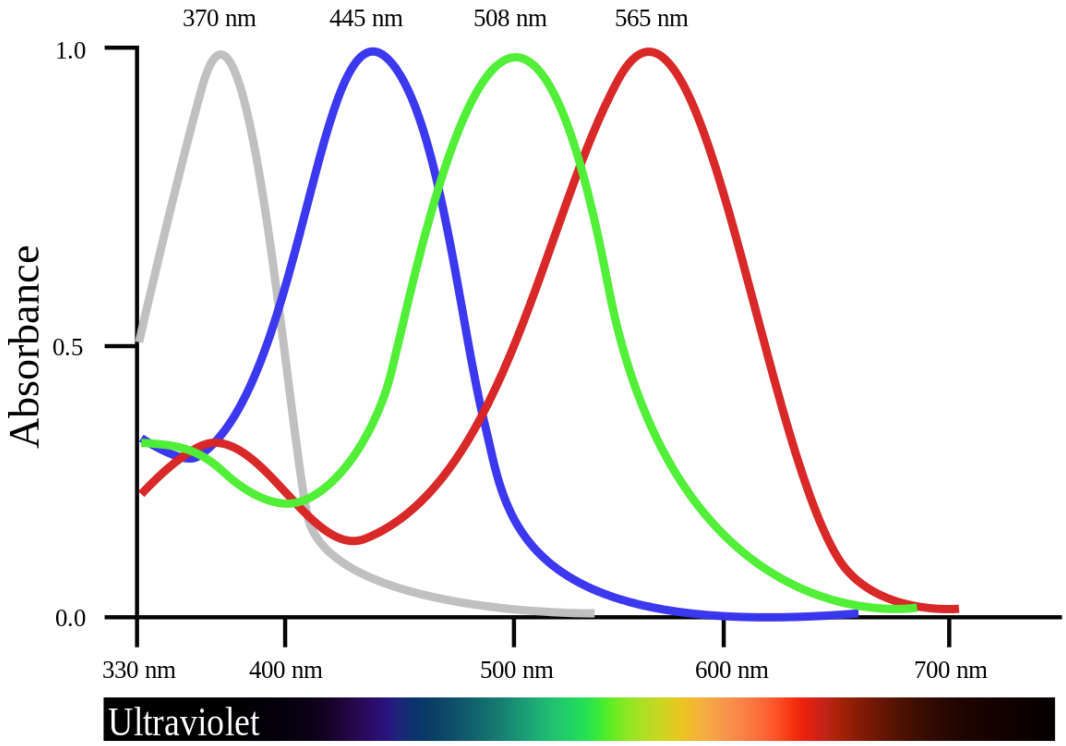
loss of function, or mutation that shifts their curve away from the normal position. And depending on the type of the defect we can experience: Anopia (protanopia or deuteranopia)or anomaly (protanomaly or deuteranomaly).

Because the genes are found on the X chromosome, these defects are more common in males than females, and around 4-6% of males have colour blindness.Also green > red /deuteranomaly > protanomaly.

Still most people who have colour blindness even complete deuteraopia never know about it and the doctor said they see the trees green, because the retina will detect different wave lengthsand send them to cortex for example green wavelength 490 will activate cortex in (31%,37%,42% for each red,blue,green cones), these percentages will go to the cortex and the cortex will determine that these exact numbers (code) are “Light green”, now different values might be processed by the cortex as “dark green”, So even if the person has a complete missing wavelength, there won’t be 2 areas on the remaining curves which give the same values and thus the cortex will interpret them as different colours.

The patient who has complete loss of green cone , in the same previous example green wavelength490 will activates (31%,37%) without 42% of green cone and as result that there are no other colour has same pattern the cortex will know it is light green not other one .so the patient will see the colour but in decreasing of chain .

Normal curve:



So where's the problem? Now on some types of the disease the curve will be shifted in a manner where 2 areas give the same values for example orange is (0,83), and yellow is (0, 83) so both of these colours will look the same to the cortex. However, when the person sees one of these on a banana and the other one on an orange, the brain will still be able to tell that the first one is orange and the second one is yellow because the association cortex uses multiple sensory inputs to tell the difference, but if demonstrated on a plain object the person won't be able to tell the difference.

Now all the cases we talked about are true in cases of deuteranopia and deuteranomaly, cases of red protanopia will be worse because they won't see anything that's related to the red curve that has no intersection and cases of tritanopia which is the same thing but related to the blue curve. These people

won’t recognize these shades with their cones thus only the rods will detect these objects and they will appear Black.

The worse type of cases are people with complete loss of red and green curve, so the area where they’re supposed to be will always be interpreted as a grey scale and since there’s only 1 curve (blue) so the cortex won’t be able to the difference between the shades because the values detected are similar. Luckily, these cases are extremely rare.

Now, let’s talk about neurotransmitters:

As we know one of the families of neurotransmitters is called biogenic amines,which includes: dopamine,norepinephrineand epinephrine. All these neurotransmitters have same shaped synapses, are inhibited in the synaptic cleft by enzyme degradation (COMT and MAO)and also terminate by transportersthat may be selective or non – selective.

Norepinephrine transporter is inhibited by amphetamine, cocaine doesn’t affect it almost at all, they are also affected by desipramine drug.

Norepinephrine cells are located ina small area in the brain stem called locus ceruleus. From this region Norepinephrine is released to all regions in the brain such as the cerebellum, spinal cord and cortical regions as the prefrontal and frontal lobes which are the most important.

Remember that the prefrontal area plays a role in attention,is the masterof the brain, mood and social interaction. So, a defect in norepinephrine will affect all these functions.In addition,Norepinephrine is an activator, it will play a role in sleep-wake cycle.

There isa very strong relation between a decrease in Norepinephrine and loss of attention by the prefrontal area. This is why the most popular diseases associated with attention such as ADD, ADHT and AADD (which happen in early adulthood) are related to Norepinephrine.

One function of locus ceruleus is to be activated by a new stimulus, and release Norepinephrine to affect the prefrontal to pay attention to what ishappening.

The increase in the level of Norepinephrine will also affect the prefrontal area.In this case it will not pay good attention leading to anxiety disorders such as OCD and anxiety like disorders.

We also know that in front of the prefrontal areaare mood region.From this point we conclude how different receptors give different functions.

The caudal part of theprefrontal area, which responsible of attention, contains alpha-2 receptors.New drugs noware targeting the alpha -2 receptor instead of its transporter.

In the frontal -rostral - part of the prefrontal are beta-1 receptors, which are associated with mood.Loss of norepinephrine there will cause depression .