



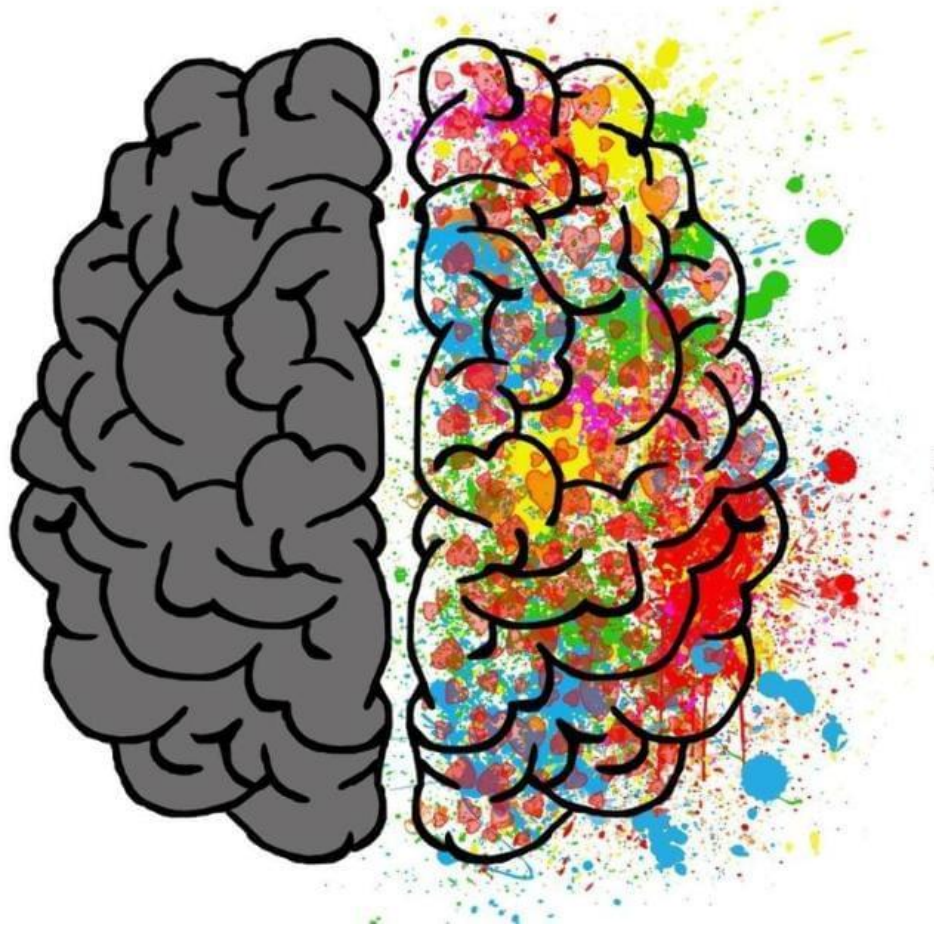
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Corpus Callosum and Epilepsy (Split Brain Syndrome)

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Abstract:

Corpus Callostomy is a palliative surgical procedure for the treatment of medically refractory epilepsy. In this procedure, the corpus callosum is cut through in an effort to limit the spread of epileptic activity between the two halves of the brain.

The loss of connection between the two hemispheres leads to a major complication known as Split-Brain syndrome. Since the start of performing Callostomy as a treatment for epilepsy, several studies and researches have been done to better understand the phenomenon of split-brain syndrome. Moreover, the interesting changes in the brains of split-brain patients helped to form a better understanding of the perception and consciousness of the brain, and knowing the functional specialization of the cerebral hemispheres.

Introduction:

The Corpus Callosum (CC) is the part of the mind that allows communication between the two hemispheres of the brain; therefore it is responsible for transmitting neural messages between both the right and left hemispheres.¹

Studies have showed that the CC plays an important role in generalization of seizure activity; seeing how it is a commissure fiber bundle in the brain (largest forebrain commissure) that connects bilateral cerebral hemispheres.²

Epilepsy is a chronic disorder that causes unprovoked, recurrent seizures. A seizure is defined as an abnormal, disorderly discharging of the brain's nerve cells or in other words, it is a sudden rush of electrical activity in the brain, resulting in a temporary disturbance of motor, sensory, or mental function.³

There are two main types of seizures.

1. Generalized seizures that affect the whole brain.
2. Focal or partial seizures, that affect just one part of the brain.⁴

The first-line treatment for epilepsy is antiseizure medication but if medication cannot decrease the number of seizures, another option is surgery.

Two types of brain surgery can cut down on or eliminate seizures.

- One type, called **resection**, involves removing the part of the brain where seizures originate.

When the area of the brain responsible for seizures is too vital or large to remove, the surgeon can perform a **disconnection**.

- This involves interrupting the nerve pathway by making cuts in the brain. This keeps seizures from spreading to other parts of the brain (Callostomy).⁵

The widespread cortical connection through the CC is assumed to implicate the interhemispheric transmission of epileptic electricity. Therefore, Callostomy, a surgical operation indicated to decrease the severity and frequency of secondary generalization in patients with pharmaco-resistant focal seizures.

Therefore, in drug-resistant epilepsies with violent drops to the floor ("drop seizures") Callosotomy may be beneficial in seizure reduction.⁶

After the right and left-brain are separated following Callosotomy, each hemisphere will have its own separate perception, concepts, and impulses to act. Having two "brains" in one body can create some interesting dilemmas known as **Split Brain syndrome**.⁷

Discussion:

A Brief History of Split Brain Experiments

Roger Sperry and Ronald Meyers first discovered the "split brain" in the laboratory in the late 1950's. Initially they began experimenting with cats, and later proceeded to study monkeys. In 1961, the first human patient was subject to the split-brain surgery.

The procedure worked well as a "cure" for patients who suffered from severe epilepsy and did not respond to anti-epileptic drugs. It was soon discovered that patients who had a commissurotomy had some interesting difficulties. Patients were not able to communicate information from one hemisphere to the other, almost as though they now had two separate brains.

When one split-brain patient dressed himself, he sometimes pulled his pants up with one hand (that side of his brain wanted to get dressed) and down with the other (this side did not). In addition, once he grabbed his wife with his left hand and shook her violently, so his right hand came to her aid and grabbed the aggressive left hand. However, such conflicts are actually rare. If a conflict arises, one hemisphere usually overrides the other.

When split-brain patients are shown an image only in their left visual field (the left half of what both eyes take in), they cannot vocally name what they have seen.

This can be explained in three steps:

- (1) The image seen in the left visual field is sent only to the right side of the brain
- (2) For most people, the speech-control center is on the left side of the brain
- (3) Communication between the two sides of the brain is inhibited.

Thus, the patient cannot say out loud the name of that which the right side of the brain is seeing. In the case that the speech-control center is on the right side of the brain, the image must now be presented to only the right visual field to achieve the same effect.⁸

Scientists have often wondered especially recently whether split-brain patients, who have had the two hemispheres of their brain surgically disconnected, are 'of two minds' and whether consciousness appears to still take a unified state or is split.

Does Split Brain lead to split consciousness?

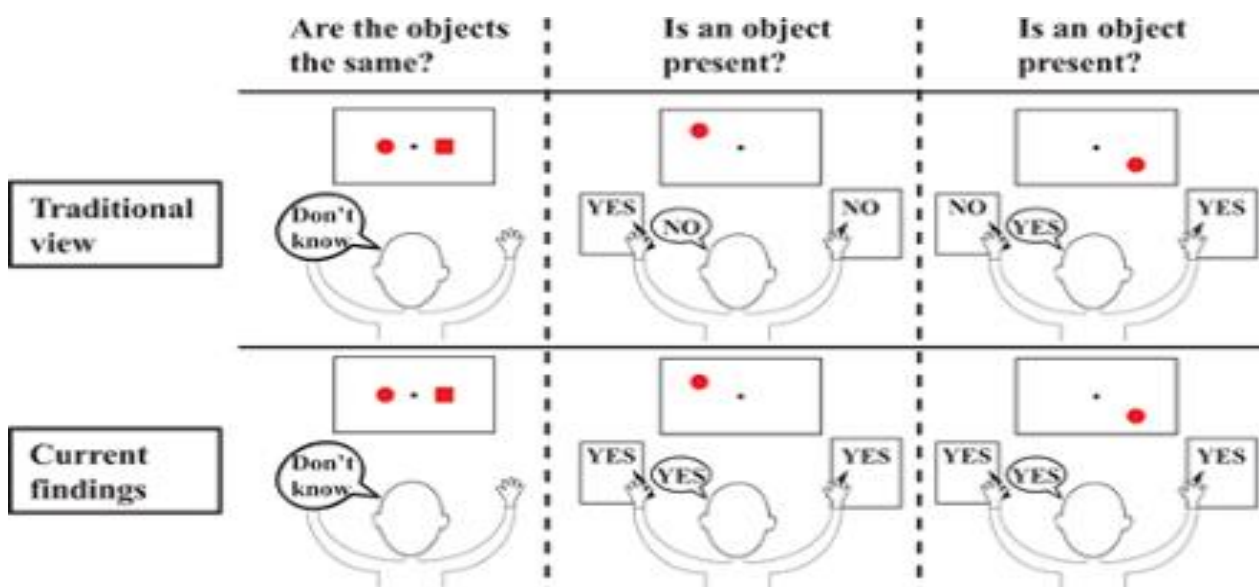
Researchers conducted a series of tests on two patients who had undergone a full Callosotomy. In one of the tests, the patients were placed in front of a screen and shown

various objects displayed in several locations. The patients were then asked to confirm whether an object appeared and to indicate its location. In another test, they had to correctly name the object they had seen, a notorious difficulty among split-brain patients.

To the researchers' surprise, the patients were able to respond to stimuli throughout the entire visual field with all the response types: left hand, right hand and verbally.

The results present clear evidence for unity of consciousness in split-brain patients. The established view of split-brain patients implies that physical connections transmitting massive amounts of information are indispensable for unified consciousness, i.e. one conscious agent in one brain. The new findings from the researchers, however, reveal that although the two hemispheres are completely insulated from each other, the brain as a whole is still able to produce only one conscious agent

Therefore, it was proven that Split-brain patients have divided perception but undivided consciousness.⁹

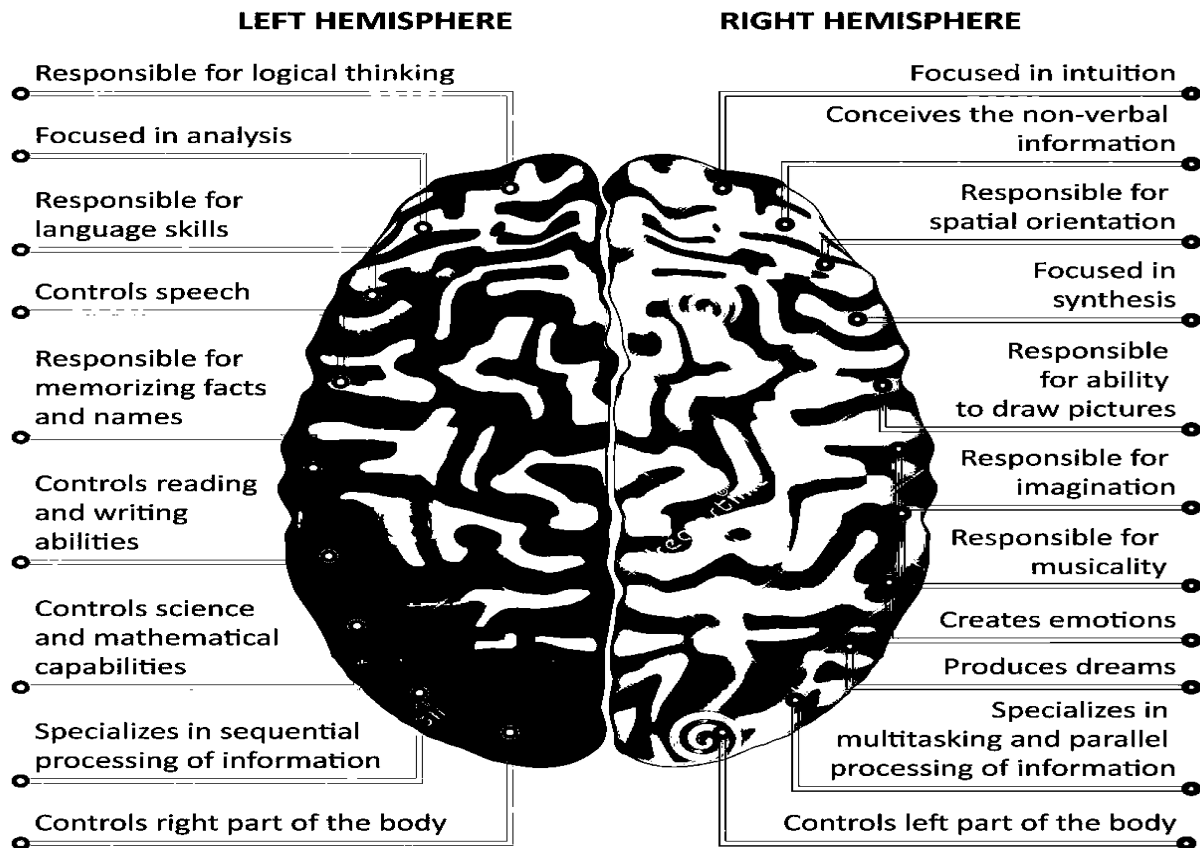


What Came Out of the Split Brain Experiments?

The studies demonstrated that the left and right hemispheres are specialized in different tasks. The left side of the brain is normally specialized in taking care of the analytical and verbal tasks. The left side speaks much better than the right side, while the right half takes care of the space perception tasks and music, for example.

The right hemisphere is involved when you are making a map or giving directions on how to get to your home from the bus station. The right hemisphere can only produce rudimentary words and phrases, but contributes emotional context to language.

Without the help from the right hemisphere, you would be able to read the word "pig" for instance, but you would not be able to imagine what it is.¹⁰



Conclusion:

So in conclusion in drug-resistant epilepsies with violent drops to the floor a Callostomy was indicated as a palliative treatment, and for a long period of time since it was first performed it was highly recommended for epileptic patients until an interesting phenomenon known as split brain syndrome raised in patients that underwent the procedure.

The researches and studies that were performed on the Split brain Patients had several interesting findings and with those findings, several questions and considerations rose, but some of the most important questions were whether Split-brain patients had a split consciousness? And, what came out of the split-brain experiments?

A new research study contradicts the established view that so-called split-brain patients have a split consciousness. Instead, the researchers behind the study, led by UvA psychologist Yair Pinto, have found strong evidence showing that despite being characterized by little to no communication between the right and left-brain hemispheres, split brain does not cause two independent conscious perceivers in one brain.

In addition, all the studies that were conducted on the split-brain phenomenon helped in demonstrating that the left and right hemispheres are specialized in different tasks and a better understanding of those tasks was revealed.

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