

Module 13 - The Brain/Split Brain


1/23/2019

UNIT III

Biological Bases of Behavior

MODULES

- 10 Biological Psychology and Neurotransmission
- 11 The Nervous and Endocrine Systems
- 12 Studying the Brain, and Older Brain Structures
- 13 The Cerebral Cortex
- 14 Brain Hemisphere Organization and the Biology of Consciousness
- 15 Behavior Genetics: Predicting Individual Differences
- 16 Evolutionary Psychology: Understanding Human Nature



Learning Targets

Module 13


- 13-1 Explain what split brains reveal about the functions of our two hemispheres.
- 13-2 Discuss the dual processing being revealed by today's cognitive neuroscience.

Brain Hemisphere Organization and the Biology of Consciousness

What is meant by a split brain?

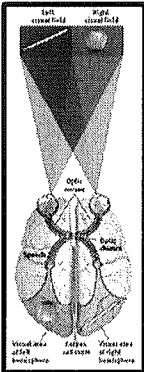
The corpus callosum is a wide band of axon fibers connecting the two hemispheres of the brain.

Split brain results when the fibers of the corpus callosum are severed isolating each hemisphere from the other.



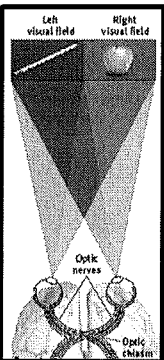
How are the eyes wired to the brain?

In each eye, information from the left visual field goes to your right hemisphere, and information from the right half of your visual field goes to your left hemisphere.



What is a visual field?

Along the retina of the eye, sense receptors pick up stimuli that is about two inches apart – the right sides of both retinas gather information from the left side of what you are looking at and vice versa.



How is a split brain different from an intact brain?

In an individual with an intact brain, information is readily transferred across the corpus callosum from both hemispheres of the brain.

In an individual with a "split brain" this cross-transference does not occur. Researchers are able to send information to one hemisphere and test patients.

How did Michael Gazzaniga study the split brains of patients?

The first step...

Patients with a severed corpus callosum ("split brain") were asked to look at a dot in the center of a screen. This created a left and right *visual field*.

"Look at the dot."

What happened next ...

The word "HEART" was flashed on the screen so that the word "HE" was in the left visual field and the word "ART" appeared in the right visual field.

Two words separated by a dot are momentarily projected.

The third step...

Patients were asked to *tell* Gazzaniga what they had seen. Patients reported seeing the word "ART".

"What word did you see?"

Let's think about that...

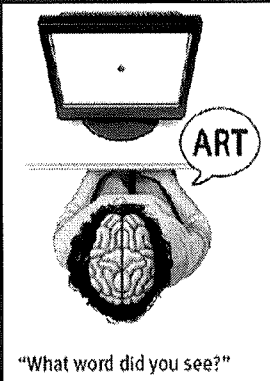
Due to the brain's cross wiring, objects in the right *visual field* are perceived in the left *hemisphere*.

What does the left hemisphere do?

The left hemisphere contains two association areas, Broca's area and Wernicke's area that are involved in expressive and receptive language.

So let's recap...

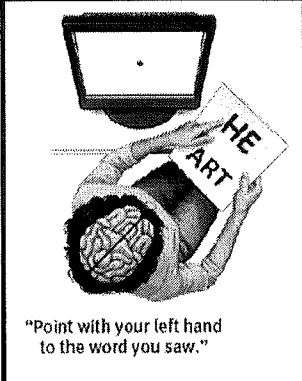
- The patient saw "ART" in the *right visual field*.
- The information was processed in the *left hemisphere*.
- The left hemisphere controls language.
- The patient said "ART".



"What word did you see?"

But wait... there's more...

Due to the brain's cross-wiring, the *left hand*, which is controlled by the *right hemisphere* pointed to the word flashed in the *left visual field*.



"Point with your left hand to the word you saw."

TRY IT

In working with a split brain patient, a researcher flashes a picture of a palm tree in the *left visual field* and a ice cream cone in the *right visual field*. Can you predict what will happen when...

The patient is asked to *tell* what is seen.

The patient is asked to use the *right hand* to point to the object seen.

The patient is asked to use the *left hand* to point to the object seen.

1. What Would You Answer?

A split-brain patient has a picture of a dog flashed to his *right hemisphere* and a cat to his *left hemisphere*. He will be able to identify the

- cat using his right hand.
- dog using his right hand.
- dog using either hand.
- cat using either hand.
- cat using his left hand.

AP® Exam Tip 1

In the What Would You Answer question you just tried, did you catch that the researcher flashed the picture to the *right hemisphere* of the brain? (Not the *right visual field*?)

It is important to pay attention to the question and make sure you note whether the term *hemisphere* is used, or *visual field* is used... remember, the image in the visual field is processed in the opposite hemisphere of the brain.

There is typically a question about split brain on the AP® Exam.

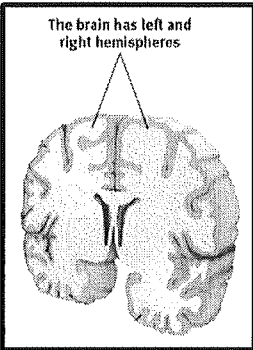
What are a few differences in function between the left and right hemispheres?

left hemisphere	right hemisphere
<p style="text-align: center;"><i>In most people:</i></p> <ul style="list-style-type: none"> ▪ speaking and language <ul style="list-style-type: none"> ▪ math calculations <ul style="list-style-type: none"> ▪ making literal interpretations ▪ controlling the right side of the body 	<p style="text-align: center;"><i>In most people:</i></p> <ul style="list-style-type: none"> ▪ perceptual tasks ▪ making inferences ▪ modulating speech ▪ visual perception ▪ recognition of emotion ▪ controlling the left side of the body

A point to note..

Humans do not have two brains... we have one brain...with two distinct yet coordinated hemispheres.

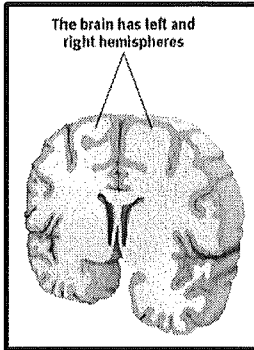
The brain has left and right hemispheres



While we're at it...

Humans are not "left-brained" or "right-brained". We use our *entire* brain to perform countless activities in an integrated manner.


The brain has left and right hemispheres



2. What Would You Answer?

Which of the following is most likely to be a function of the left hemisphere?

- A. speech
- B. evaluating perceptual tasks
- C. making inferences
- D. Identifying emotion in other people's faces
- E. Identifying one's sense of self



AP® Exam Tip 2

The classic split brain studies are likely to show up on the AP® exam.

Notice that your authors never refer to your left brain or your right brain. You have two brain hemispheres, each with its own responsibilities, *but you only have one brain.* It's very misleading when the media refers to the left brain and the right brain, and this happens frequently.

When studying for the AP® exam, try to stay away from psychology myths.

How do cognitive neuroscientists study consciousness?

consciousness	cognitive neuroscience
Our subjective awareness of ourselves and our environment. Helps us cope with novelty and act in our best interests.	Combines the study of brain activity with how we learn, think, remember and perceive. Researchers are exploring and mapping the conscious functions of the cortex.

What is dual processing?

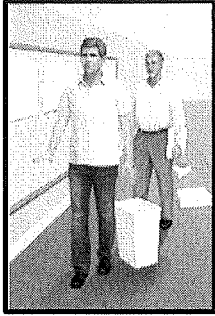
The principle that information is often simultaneously processed on separate conscious and unconscious tracks. The two-track mind.

Perception, memory, thinking, language, and attitudes all operate on two levels—a conscious, deliberate "high road" and an unconscious, automatic "low road."

The high road is reflective, the low road intuitive.

What is blindsight?

A condition in which a person can respond to a visual stimulus without consciously experiencing it.



3. What Would You Answer?

The dual processing model refers to which of the following ideas?

- A. The right and left hemispheres of the brain both process incoming messages.
- B. Incoming information is processed by both conscious and unconscious tracks.
- C. Each lobe of the brain processes incoming information.
- D. The brain first processes emotional information and then processes analytical information.
- E. The thalamus and hypothalamus work together to analyze incoming sensory information.

What is the difference between parallel and sequential processing?

parallel processing	sequential processing
unconscious processing of many aspects of a problem simultaneously;	conscious processing or one aspect of a problem at a time;
generally used to process well-learned information or to solve easy problems	generally used to process new information or to solve difficult problems

Learning Target 13-1 Review

🎯 Explain what split brains reveal about the functions of our two hemispheres.

Split brain research (experiments on people with a severed *corpus callosum*) has confirmed that in most people, the left hemisphere is the more verbal and the right hemisphere excels in visual perception and the recognition of emotion.

Learning Target 13-2 Review

🎯 Discuss the dual processing being revealed by today's cognitive neuroscience.

Cognitive neuroscientists have discovered that the mind processes information on two separate tracks, this **dual processing** affects our perception, memory, attitudes, and other cognitions. **parallel processing** is faster than **sequential processing**. Parallel processing enables us to take care of routine business, while sequential processing provides the focus we need to solve new problems.