The Split-Brain Phenomenon

Ms. Cole

2005

http://www.angelfire.com/wi/2brains/
Lesson Outline

• Basic Neuronal Structure
• Basic Brain Structures
• Left/Right Hemisphere Specialization
• Vision
• Seizures
• Epilepsy
• Split-Brain Phenomenon
• Assignment
Basic Neuronal Structure

- Dendrites
- Soma (cell body)
- Nucleus
- Cytoplasm
- Axon
- Myelin Sheath
- Nodes of Ranvier
- Terminal Buttons

http://www.sruweb.com/~walsh/neuron.jpg
• *C. elegans* containing GFP stained myosin expressing gene found in body-wall muscle

Image courtesy of Erica Cole, Harvard University, 2005
GFP stained mouse neurons

- Soma (cell body)
- Axon
- Dendrites

Image courtesy of Dr. Josh Sanes, Harvard University, Boston, MA, Summer, 2005
Basic Brain Structure

Primary Motor Cortex

Primary Somatosensory Cortex

Frontal Lobe

Parietal Lobe

Broca's area

Wernicke's area

Temporal Lobe

Cerebellum

Occipital Lobe

Brain Stem

Lessons Outline

http://normandy.sandhills.cc.nc.us/psy150/frmlobes.html
Left/Right Hemisphere Specialization

**LEFT**
- Analytic thought
  - Step by step process
- Logic
  - Conclusions based upon a logical or consecutive order
- Language
  - Using words to name/describe/define
- Math & Science
  - Number use, awareness of time, symbols, facts & linear reasoning

**RIGHT**
- Holistic thought
  - Seeing “big” picture before understanding details
- Intuition
  - Insight based upon incomplete patterns or “hunches”
- Creativity
  - Demonstrative with minimal word use, understanding relationships
- Art & Music
  - Putting pieces together to form “wholes”
Vision - Part 1

• Right side of your brain controls your Left body functions
• Left side of your brain controls your Right body functions

• Each eyeball is divided into 2 parts
  – Right Visual Field
  – Left Visual Field

• Right Hemisphere receives visual info from LVF only
• Left Hemisphere receives visual info from RVF only
Vision - Part 2

- Left Visual Field is illustrated in **RED**
- Right Visual Field is illustrated in **BLUE**
Seizures

• 3 basic types
  – Grand Mal
    • Involves total body convulsions, aka “tonic-clonic”
  – Petit Mal
    • Involves isolated body part convulsion, aka “focal”
  – Absence
    • Patient becomes unresponsive, and has no memory of occurrence. Appears to be day-dreaming but cannot awake. Very rare.
What is a seizure?

1. Abnormal discharge of electrical impulses within the brain

2. Rather than smooth constant production of Action Potentials, neurons fire without any regulation, causing disruption to brain function at the biochemical level

3. Seizures generally have 3 parts:
   - Aura - period of warning, usually olfactory or visual
   - Ictus - actual seizure period
   - Postictal state - time where body “resets” itself
Causes of Seizures

- Alcohol Poisoning
- Drug Overdose/Reaction
- Head Injury
- Fever (especially in children)
- Neurological Defect (usually genetic)
- Sepsis (in brain)
- Brain Tumor
- Stroke
- Epilepsy
Epilepsy

• A seizure disorder in which reoccurring seizures are the main symptom caused by an abnormal discharge of electrical activity from the neurons in the cerebral cortex.
• In the US more than 4 million people have some form of epilepsy (http:www.neurologychannel.com/seizures)
• Risk of epilepsy is greatest in early childhood and late adulthood.
• Seizures have been found depicted as early as in cavepaintings!
• 4,000 year old writings depict epileptics as “possessed by demons’
• Julius Ceasar, King Charles II, Vincent Van Gogh and novelist Dustoyevsky have all been reported as suffering from seizures!
Treatments for Epilepsy

• 3 major courses of treatment:
  
  Drugs
  • Generally first line of attack because it is effective, relatively inexpensive, and safe
  
  Diet
  • Ketogenic diet - lots of fat and almost no carbohydrates
  • This diet drastically alters the way our bodies get energy from food - instead of making glucose, it makes ketones
  
  Surgery
  • Commissurotomy
Commissurotomy

- For patients with frequent and violent epileptic seizures, surgically splitting the corpus callosum was the only relief - known as a “commissurotomy”
- Corpus callosum is a bundle of nerve fibers which serve to connect the right and left cerebral hemispheres

http://nobelprize.org/medicine/educational/split-brain/background.html

pegasus.cc.ucf.edu/~Brainmd1/callosum.html

Lesson Outline
Split - Brain Phenomenon

- Over 30 years ago studies of patients with a severed corpus callosum discovered some interesting side effects
- Roger Sperry & Michael Gazzaniga were in the forefront in utilizing these discoveries to determine significant ideas concerning brain function
- "The Man with 2 Brains" (click on play video)
Split-Brain Discoveries

- Ability to speak resides almost exclusively in Left Hemisphere (word recognition)
- Ability to recognize faces resides almost exclusively in Right Hemisphere (Archimbaldo paintings)
- “Don’t leave home without your left hemisphere!” - Michael Gazzaniga
- “The great pleasure and feeling in my right brain is more than my left brain can find the words to tell you.” - Roger Sperry
Assignment

You are to create a power point presentation similar to this one in which you investigate a neurological disease.

Choose one disease from the websites below for your project. I must know which disease you will research ASAP. In order to get the most “bang for our buck” each of you will have a different disease topic - it’s first come first serve!

Neurological diseases 1     Neurological diseases 2
Requirements

• Title Slide
• Outline Slide
• Informational Slides
  1. Diagnosis
  2. Organism Causing Disease
  3. Symptoms
  4. Type of Transmission
  5. Treatment(s)
  6. Vaccine available?
  7. Prognosis
  8. Scientific Journal Article
• References
The End!