

What Is Psychology?

Biology and Behavior

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Printed in the United States of America.

ISBN: 1-56004-185-4

Product Code: ZP832

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Introduction

This PowerPoint® presentation is designed to offer your students an overview of key events, personalities, and concepts. Created by a classroom teacher, the slide show places a premium on ease of use and succinctness. We developed this title to:

- Engage students with visual elements
- Outline key historical issues
- Make learning clear and relevant
- Provide a customizable template for differentiated instruction

On the slides themselves, bullet points highlight central elements, and numerous images help to provide a visual context for the presentation. Extensive notes for each slide offer detailed information to help elaborate bullet points. Handouts provide a convenient way for students to make connections between the ideas presented, and the culminating quiz provides a convenient way to assess student comprehension.

It is not necessary to cover every bullet point on every slide. One of the real benefits of this medium is the flexibility it affords you. We realize that each class and each student has different needs that require different approaches to teaching. Use this presentation to help customize your teaching. Use the “View” menu in PowerPoint® to sort through the slides visually, to view the presentation as a table of contents, or to see the larger groupings of sections and chapters.

If you want to focus on certain images or make a more detailed exploration of a particular area, you can easily add or delete slides. Simply copy the presentation to your own computer and modify it to create the exact messages that you want to convey. You may also wish to search the Web for additional images, sounds, graphs, timelines, or even video clips to incorporate into the presentation.

We are dedicated to continually improving our products and working with teachers to develop exciting and effective tools for the classroom. We can offer advice on how to maximize the use of the product and share others’ experiences. We would also be happy to work with you on ideas for customizing the presentation.

We value your feedback, so please let us know more about the ways in which you use this product to supplement your lessons; we’re also eager to hear any recommendations you might have for ways in which we can expand the functionality of this product in future editions. We look forward to hearing from you.

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Biology & Behavior

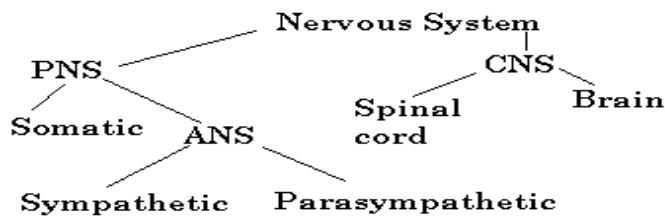


Slide # 1

This presentation will focus on the biological factors that influence our behavior. We will look at how the brain processes information. We will examine the structures of the brain and the roles each part of the brain plays. We will also examine the endocrine system and its effect on our behavior. In addition, there will be a special section on brain injuries and infections.

Your brain weighs about three pounds, but may contain as many as ten billion neurons. It is amazing how well the human brain works, although injury to even a small part of the brain can cause dramatic changes in behavior. Chemical imbalances can also affect behavior, causing depression, mood swings, schizophrenia, or movement disorders and loss of memory. This unit involves a great deal of biological psychology, which is the study of the cells and organs of the body and the physical and chemical changes involved in our behavior and thinking.

Diagram of the Nervous System



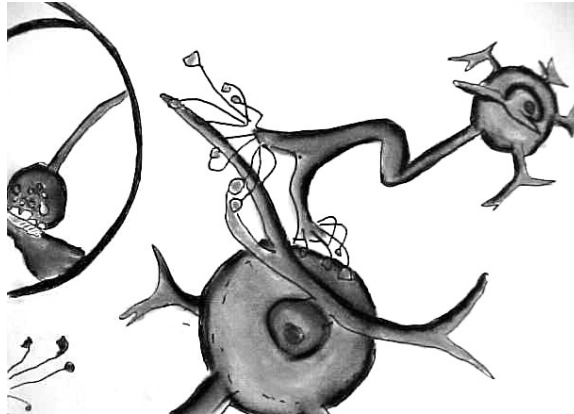
Slide # 2

This is a diagram of the nervous system. You can see that the main divisions separate the central nervous system (CNS) from the peripheral nervous system (PNS). The central nervous system is composed of the brain and spinal cord; the peripheral nervous system is divided into the somatic nervous system, which controls voluntary body movements, and the autonomic nervous system (ANS), which controls involuntary responses. The ANS is then further divided into the sympathetic and parasympathetic systems.

The nerves of the peripheral nervous system conduct information from the bodily organs to the central nervous system (CNS) and send information back to the organs. These neurons in turn branch out from the spinal cord (they are about the thickness of a pencil). Some nerves are so small that they are invisible.

The sympathetic nervous system kicks into gear when there is an emergency. This is the “fight or flight” part of the nervous system—the “on” switch that makes us react to danger. The parasympathetic nervous system returns our body to a normal, relaxed mode.

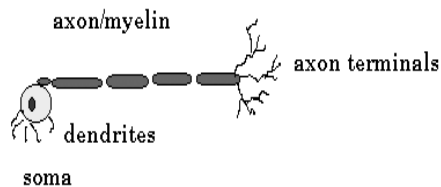
Neurons



Slide # 3

This drawing presents a simplified version of how of neurons connect. The dendrites appear on the cell body, much like a root. The axons are long, branch-like structures that nearly touch the next neuron. The small blue, bell-like structures are the synaptic knobs, which contain neurotransmitters. At the bottom of the drawing you can see an enlarged image of a synaptic knob nearly touching another neuron.

Axons



- Thread-like extensions from the cell body
- Tube-like fibers that carry impulses away from the soma to the dendrites
- Myelin coating

Slide # 4

Bullet # 1 Axons are thread-like extensions that emanate from the soma/cell body.

Bullet # 2 Axon fibers carry impulses away from the cell body toward the dendrites of another neuron.

Bullet # 3 Most axons, especially those found in the brain, are very short (about 1/25th of an inch long). Axons in other parts of the nervous system can be several feet long. Axons in the PNS (peripheral nervous system) are covered with a white, fatty material called myelin that insulates the nerve fiber and speeds transmission of impulses. Myelin is similar to insulation on an electric wire. Axons with myelin are known as “white matter;” axons without myelin are known as “gray matter.” Axon terminals branch out from the ends of the axon, and are positioned opposite the dendrites of a neuron.

Multiple Sclerosis



- MS destroys myelin sheaths of axons
- This can cause erratic and uncoordinated behavior

Slide # 5

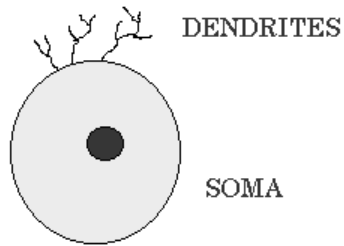
Bullets # 1–2 When a person has multiple sclerosis, the disease attacks the myelin coatings of axons. A person's behavior can consequently become erratic and uncoordinated. Famous people with MS include former child star and Disney Mouseketeer Annette Funicello and talk show host Montel Williams.



Slide # 6

This is a photograph of a woman named Susan who has been living with multiple sclerosis for a number of years. MS is a chronic, degenerative disease that attacks the central nervous system with varying degrees of severity. Some patients exhibit mild symptoms, while others become severely disabled. MS progresses relatively slowly compared to other diseases, but it does force people who suffer from it to make a number of major life changes as the physical effects get worse. Some 400,000 people in the US suffer from MS. The impact of the disease is also felt by family members, friends, employers, and caregivers. Every hour, one person in America is diagnosed with MS. Currently, there is no cure.

Dendrites



- Short, thin fibers that stick out from the cell body
- Dendrites receive impulses or messages from other neurons and send them to the cell body

Slide # 7

Bullets # 1–2 Dendrites are short, thin fibers that protrude from the cell body. Their main task is to receive impulses or messages from other neurons and send them to the cell body. Note: The word “dendrite” is Greek for “tree.”

Characteristics of Neurons

- They cannot replace themselves
- Damage is permanent
- Threshold of excitation

Slide # 8

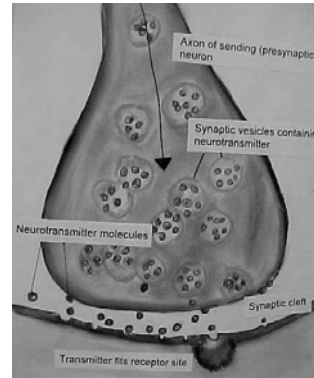
Bullets # 1–2 Damage to neurons is permanent and irreversible. They do not have the ability to regenerate themselves.

Bullet # 3 When a neuron transmits a message to a neighboring neuron, the neuron on the receiving end experiences a slight change in its electrical charge. If this change in electrical charge is large enough to exceed what is known as the “threshold of excitation,” the receiving neuron will also fire. Neurons can fire at speeds approaching 250 miles per hour.

Special note: Even though damage to neurons is permanent, other parts of the brain can take over functions that have been lost. Hydrocephalus (water on the brain) can cause irreparable neuronal damage; however, the installation of a valve developed in the 1950s uses the heart as a pump to control the accumulation of cerebrospinal fluid. This device has saved countless lives and enabled some hydrocephalics to lead a relatively normal life.

The Neuron Connection

- Synapse junction
- Neurotransmitters
- Open chemical “locks”
- Inhibition



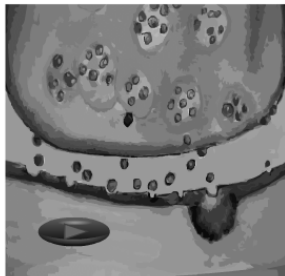
Slide # 9

Bullet # 1 The space between the axon terminal of one neuron and the dendrites of another neuron is called the synapse. It acts as a kind of junction or connection between the neurons. (Note: *synapse* is a Greek word meaning “junction.”)

Bullet # 2 A neuron transmits its impulse or signal to another neuron across the synapse by releasing chemicals called neurotransmitters.

Bullets # 3–4 Neurotransmitters have specific “receptor sites” on the other side of the synapse. They fit into these receptor sites like a key in the lock of a door. The way that neurotransmitters fit into these “locks” can either excite the next neuron or prevent it from transmitting. This process is known as “inhibition.” Neurotransmitters are similar to traffic cops: they make sure that neural activity is orderly and that it flows in the proper direction.

How a Neuron Fires



Slide # 10

When a neural impulse triggers the release of a neurotransmitter, the neurotransmitter molecule diffuses across the synaptic cleft (gap) and binds to receptor sites on the postsynaptic (receiving) neuron. A specific neurotransmitter can only bind to receptor sites that its molecular structure will fit into, much like how a key must fit a specific lock.

Special note to the teacher: Click on the blue arrow button to play a Flash movie that illustrates how this process works.

Neurotransmitters

- Acetylcholine (memory, movement)
- Norepinephrine (memory, learning)
- Serotonin (sleep, appetite)
- Endorphins (inhibits pain)
- Dopamine (learning, emotions, movement)

Slide # 11

Bullet # 1 There are many different neurotransmitters. Acetylcholine is related to movement and memory. If there is an undersupply of this neurotransmitter, a person can suffer from Alzheimer's disease.

Bullet # 2 Norepinephrine affects memory and learning. An undersupply of this neurotransmitter can lead to depression. Norepinephrine also contributes to changes in mood.

Bullet # 3 Serotonin governs sleep patterns, appetite, and body temperature. If serotonin levels fall, a person can become depressed. Abnormal levels of serotonin may also be related to obsessive-compulsive behavior.

Bullet # 4 Endorphins are natural painkillers created by the brain. Morphine and other drugs classified as opiates are quite similar to endorphins and fit into many of the same receptor sites in the brain as endorphins. If a person abuses opiates, they develop a tolerance for them; when they stop, the brain's natural endorphins aren't sufficient, and the person goes through withdrawal.

Bullet # 5 Dopamine affects learning, emotions, and movement. An oversupply of dopamine can cause schizophrenia, while an undersupply can cause Parkinson's disease.

Types of Neurons

- Ascending vs. descending tracts
- Afferent/Sensory neurons
- Efferent/Motor neurons
- Interneurons/Connecting neurons

Slide # 12

Bullet # 1 Ascending tracts carry sensory information or impulses to the brain. Descending tracts carry motor impulses from the brain. The actual destination of nerve impulses is limited by the tract in the nervous system in which they're located.

Bullet # 2 Afferent neurons (also known as sensory neurons) relay messages to the brain from the sense organs like the skin, eyes, and nose.

Bullet # 3 Efferent neurons (also known as motor neurons) send signals from the brain to the body's glands and muscles.

Bullet # 4 Interneurons carry nerve impulses between the neurons and the body.

Voluntary vs. Involuntary



- Somatic nervous system (voluntary activities)
- Autonomic nervous system (involuntary activities)

Slide # 13

Bullet # 1 The somatic nervous system is the part of the peripheral nervous system that controls voluntary activities. It makes our bodies move.

Bullet # 2 The autonomic nervous system controls all of our involuntary responses, including breathing, heart rate, stomach activity, and many others. We are usually not conscious or aware of these activities.

The two photographs above show the subtle change in the size of the pupil of the eye in response to light. This change is an involuntary activity. The pupils of your eyes get smaller after they are exposed to bright light (the top photo). The bottom photo shows the eye in normal light.

Divisions of the Autonomic Nervous System



- Sympathetic nervous system
- 1. Fight or flight
- 2. Speeds up heart rate/O² supply and blood pressure
- 3. It constricts some arteries, relaxes others

Slide # 14

Bullet # 1 The sympathetic nervous system prepares our bodies for emergencies or strenuous physical activity.

Bullet # 2 It has been called the “fight or flight” part of our nervous system. When an emergency arises, the SNS speeds up heart rate and respiration. It causes a constriction of some arteries while relaxing others. It sends blood to the muscles, where it is needed most. It also suppresses activities like digestion. In all, the sympathetic nervous system acts like a switch that turns us “on” for emergencies.

Parasympathetic Nervous System



- Works to conserve energy
- Helps us recover from strenuous activity
- Reduces heart rate and blood pressure
- Returns us to a normal resting state

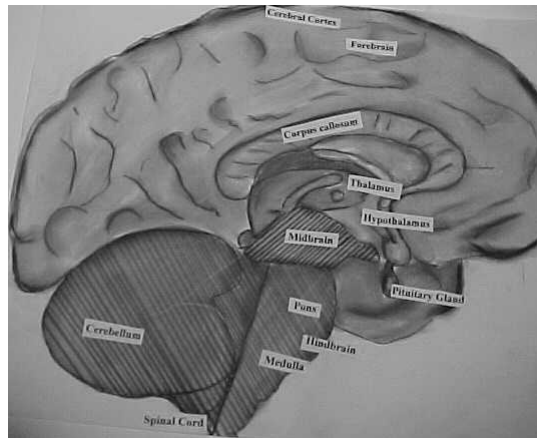
Slide # 15

Bullets # 1–2 The parasympathetic nervous system is connected to the same muscles and glands as the sympathetic nervous system. The PNS works to help us conserve energy, slow down, and relax after an emergency has ended.

Bullet # 3 The PNS reduces heart rate, respiration, and blood pressure. Digestive activity resumes. Have you ever noticed how hungry you become after a strenuous activity or some traumatic “fight or flight” event?

Bullet # 4 The amazing thing about the PNS is that all of this takes place automatically. If the ANS is our “on” switch, the PNS is our “off” switch.

The Brain



Slide # 16

This is a diagram of the human brain. The brain weighs about 3 pounds, yet requires over twenty percent of the oxygen that our body takes in.

Divisions of the Brain

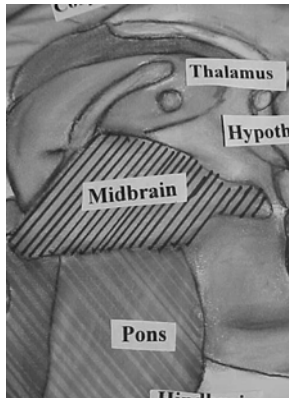


- Hindbrain, located at the rear base of the skull
- Contains the cerebellum, the medulla, the pons

Slide # 17

Bullets # 1–2 The brain has three separate divisions: the hindbrain, the midbrain, and the forebrain. The hindbrain, which is located at the rear base of the skull, regulates some of the most basic life processes. It consists of three sections: the cerebellum, the medulla, and the pons. The cerebellum, located at the base of the spinal cord, helps control posture and balance. The medulla's main function is to control respiration and other reflexes. The pons acts as a bridge, sending messages between the spinal cord and the brain. The pons also produces chemicals that our body needs to sleep.

The Midbrain



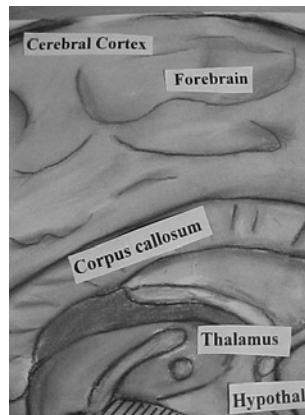
- Located just above the pons
- Function: relays sensory information
- Brain stem and reticular activating system

Slide # 18

Bullets # 1–2 The midbrain is only a small part of the brain. It's located directly above the pons. Its main function is to integrate and relay sensory information to the main part of the brain. It's somewhat similar to a telephone relay station.

Bullet # 3 Together, the medulla, the pons, and the midbrain comprise the brain stem and the Reticular Activating System (RAS), which spans all these structures. The RAS alerts the rest of the brain to incoming signals. Think of it like an airport control tower and sensory information as planes. Not all planes can take off or land at the same time. Just as an airport control tower regulates air traffic, the RAS regulates which signals the brain receives and when it receives them.

The Forebrain



- The hindbrain and forebrain compose the brain's central core
- Thalamus (information relay)
- Hypothalamus (motivation, emotion)
- Higher-thinking processes

Slide # 19

Bullet # 1 The forebrain and the hindbrain compose the brain's central core. The forebrain contains two significant regions: the thalamus and the hypothalamus.

Bullet # 2 The thalamus acts as a relay station for all information traveling to and from the brain. All sensory information (except for the sense of smell) comes through the thalamus.

Bullet # 3 The hypothalamus sits just below the thalamus. It controls motivation and emotion. It also controls hunger, thirst, sex, and body temperature, and sends messages to the pituitary gland.

Bullet # 4 The brain's higher-thinking processes also reside in the forebrain.

Higher-Thinking Processes



- Cerebral cortex
- Cerebrum

Slide # 20

Bullet # 1 The very things that make us unique are located in the forebrain. The cerebral cortex is the outermost coating of the brain. It allows us to learn, to store information, and to process emotions and sensory data. The cerebral cortex is like the bark on the tree. It is about half an inch thick.

Bullet # 2 The cerebrum is the inner layer of the forebrain. Together, both the cerebral cortex and cerebellum surround the hindbrain and the brain stem.

The Limbic System

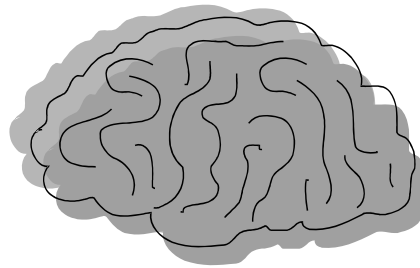
- Found in the core of the forebrain
- It has a number of different parts:
 - 1. Thalamus
 - 2. Hypothalamus
 - 3. Amygdala
 - 4. Hippocampus

Slide # 21

We have already discussed the thalamus and hypothalamus. Other parts of the limbic system include the amygdala, which controls violent emotions, and the hippocampus, which plays a central role in the formation of memories. Together, the amygdala and hippocampus also regulate emotions (such as fear and aggression) related to self-preservation. Covering all of these parts is the cerebrum. The limbic system has a great deal of control over human emotions.

Hemispheres of the Brain

- The cerebrum has two hemispheres
- The corpus callosum

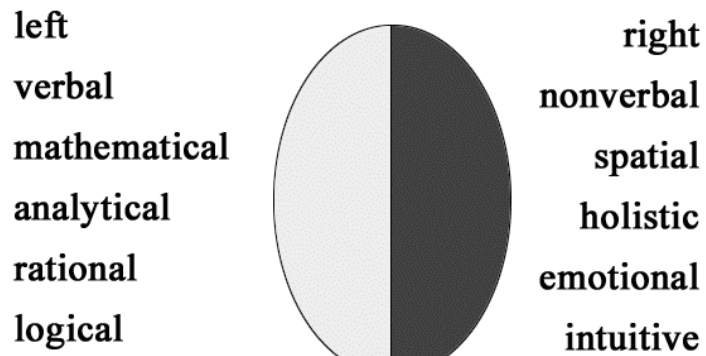


Slide # 22

Bullet # 1 The cerebrum is divided into two hemispheres that are very nearly mirror images of one another. They look deceptively alike but have very different functions.

Bullet # 2 The two cerebral hemispheres are connected by a bundle of about one million nerve fibers collectively called the corpus callosum. Each hemisphere has very deep grooves that separate it into different lobes.

Two Hemispheres



Slide # 23

Some psychologists believe that differences between the right brain and left brain have been exaggerated, but there is some specialization in the functions of each hemisphere. Each of the four lobes of the brain is present in both hemispheres. Each hemisphere is connected to half of the body in a crisscrossed manner: that is to say, the right hemisphere controls the left side of the body and vice versa. If a person has a stroke that damages the right hemisphere, paralysis would show up on the left side of the body.

Note: Music and art are better understood by the right hemisphere. Creativity and intuition are also right hemisphere functions. Some educators and psychologists believe that we need to fashion curriculum that is right-brain focused. Most curriculum is left brain driven; so are IQ tests and most standardized tests.

Righthanded vs. Lefthanded



- Handedness—a preference for using one hand
- Not an absolute
- 90% of people in the U.S. are righthanded
- Theories: environmental vs. genetic

Slide # 24

Bullets # 1–2 Hand specialization is much easier to measure than cerebral specialization. However, hand preference is not an absolute. Not everyone can be neatly categorized as righthanded or lefthanded.

Bullet # 3 In the U.S., about 90% of all Americans are righthanded, about 7%–8% are lefthanded, and the remainder display mixed-handedness. Highly accomplished lefthanders include the late guitarist Jimi Hendrix, tennis champ Martina Navratilova, ex-president Bill Clinton, and Benjamin Franklin.

Bullet # 4 Some environmental theorists argue that we are born into a righthanded world. Most tools, school desks, and pencil sharpeners are for righthanded people. Sometimes, teachers and coaches even push children to be righthanded. On the other hand (so to speak), some genetic theorists believe that hand preference is a recessive genetic trait rather than one conditioned by a person's environment.

Problems Associated With Being a Lefty

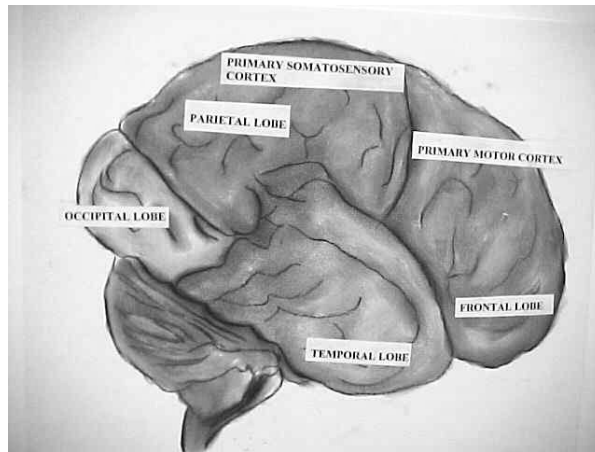
- Autism and dyslexia
- Schizophrenia
- Mental retardation
- Alcoholism
- Life expectancy

Slide # 25

Bullets # 1–4 Some researchers in the past linked lefthandedness to everything from homosexuality to criminality. None of their theories has passed the test of time. However, there are some important correlations between lefthandedness and certain conditions. Lefthanded people tend to be more prone to suffer more from autism, schizophrenia, dyslexia, mental retardation, and alcoholism.

Bullet # 5 Researchers Coren and Diane Halpern found a correlation linking handedness to life expectancy. They tested over 5000 subjects. Among the test group, the percentage of lefthanders dwindled from 13% at age 20 to 5% at age 50 and less than 1% at age 80. Some theoretical explanations as to why this occurred included the idea that lefties might be more accident-prone because they live in a world created by righthanded people: safety devices, emergency brakes, and other such lifesaving items are usually designed and placed with righties in mind.

Lobes of the Brain



Slide # 26

The lobes of the brain share the same name as the bones which overlie and protect them. The functions of the cerebral cortex are not completely understood, but psychologists have some general understanding of their most basic functions.

Lobes and Their Functions

- Frontal: planning of movements, working memory
- Temporal: hearing, advanced visual processing, memory
- Occipital: vision
- Parietal: body sensations
- Primary motor cortex: fine motor control

Slide # 27

This slide lists the four lobes that make up the cerebral cortex, and the function of each lobe. The primary motor cortex, which is a section of the frontal lobe, sends information to control body movements.

Special note: Some areas of the cortex receive sensory data from the skin senses and from muscles. It turns out that the amount of brain tissue that is connected to any given part of the body determines the brain's sensitivity to that area. For example, the sense of touch in the hand involves a much larger section of brain area than the muscles of the legs, especially the calves.

Split-Brain Surgery

- Pioneered by Roger Wolcott Sperry 1913–1994
- Used to correct epileptic seizures

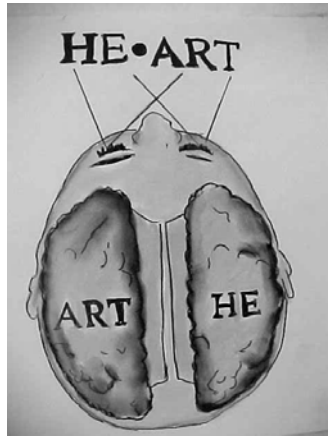


Slide # 28

Bullet # 1 Roger Sperry was a developmental neurobiologist. In the 1950s and 60s, he devised ways to measure the different functions of each of the hemispheres of the brain. In addition to distinct hemispheric functions, Sperry also believed that two separate hemispheres of consciousness exist under one skull. He won a Nobel Prize in 1981 for his split-brain research.

Bullet # 2 Split-brain operations were first used on humans to control epileptic seizures. An epileptic seizure involves massive uncontrolled electrical activity that begins in one hemisphere and spreads to the other. The surgical procedure involves cutting the corpus callosum, the neuronal fibers that join the two hemispheres. Because cutting the lines of communication between the two hemispheres is such a radical step, split-brain surgery is only used as a last resort. However, the operation does help significantly in controlling the seizures.

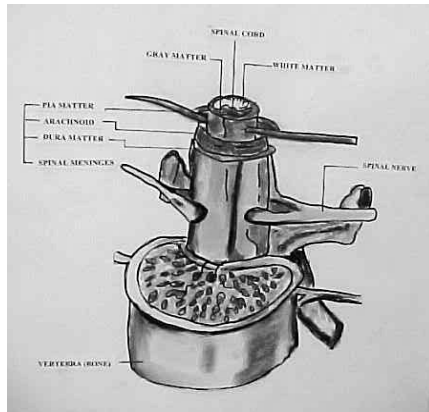
Side Effects



Slide # 29

One case study involved a patient by the name of Victoria, who had suffered severely as a result of her seizures. Medication no longer provided her any relief, so she underwent split-brain surgery. After surgery, psychologists asked Victoria to stare at a black dot between the letters HE and ART, which were projected on a screen. Information from each side of the black dot is interpreted by the opposite hemisphere of the brain: the right hemisphere will see the HE and the left hemisphere will only see ART. When they asked Victoria what she saw, she only saw the word ART, which was projected into her left hemisphere (the left hemisphere controls speech). She did see the word HE but the right hemisphere has no capacity for speech and she was unable to tell psychologists what she saw. However, when she used her left hand she could point to a picture of a man (HE). This told psychologists that her right hemisphere could understand the meaning of HE. It took about four months after her surgery until all of her abilities were again intact.

The Spinal Cord



- Dura matter
- Arachnoid
- Pia matter
- Cerebrospinal fluid
- Gray vs white matter

Slide # 30

The bones of the spinal column serve as protection for the spinal cord. Three membranes called the spinal meninges also cover and protect the spinal cord.

Bullet # 1 The dura matter is the tough protective outer coating (in the diagram it is yellow in color).

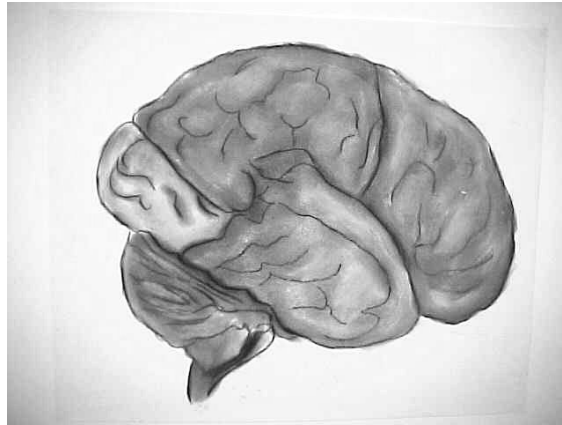
Bullet # 2 The arachnoid is the thin, transparent sheath that lies directly below the dura matter (blue).

Bullet # 3 The pia matter is the delicate tissue that contains many blood vessels and produces nourishment to cells of the brain and spinal cord (red).

Bullet # 4 Between the middle and inner membranes is a space filled with cerebrospinal fluid. It acts as a kind of shock absorber and helps protect the spinal cord from injury. Spinal meningitis is an infection of the spinal meninges. It will be discussed later in this presentation.

Bullet # 5 The spinal cord consists of two different kinds of tissues. Gray matter is the central area of the cord. It resembles the letter "H" (see top of diagram) and consists of nerve cell bodies, dendrites, and axons of connective and motor neurons. The white matter appears white because these neurons are covered with myelin.

Looking Inside the Brain



Slide # 31

The structure of the brain can be mapped out by dissecting brains removed from people who have donated their bodies to science. Mapping out brain function is quite another matter. Neuroscientists use many specialized techniques to investigate connections between brain and behavior.

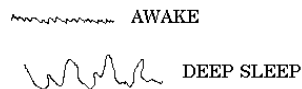
Techniques Used to Look Inside the Brain

- Electrical recordings
- Lesioning
- Electrical stimulation
- Brain imaging

Slide # 32

No special notes: The slides that follow will explain each of the techniques listed above.

Electrical Recordings



Electro-
encephalograph
(EEG)

Hans Berger

Brainwave patterns

Slide # 33

Bullets # 1–2 Hans Berger invented a machine called the EEG (electroencephalograph), which monitors the electrical activity of the brain over time. Electrodes are attached to the surface of the scalp with paste at various points on the skull. There are between eight and ten of these electronic “leads.” The resulting EEG recordings look like line tracings.

Bullet # 3 These drawings represent brainwaves. The brainwaves of a person awake look very different from those of a person who is deeply asleep. The EEG is often used to diagnose brain damage. In addition, one recent study has found a correlation between EEG patterns and personality (Jones and Fox, 1992).

Lesioning



- Brain tumors, strokes, head injuries all cause brain damage
- H. Gardner, 1975
- Limitations/ experiments with animals

Slide # 34

Bullet # 1 Tumors, head injuries, and strokes are all capable of producing brain damage. Brain-damaged people consequently suffer from behavioral changes.

Bullet # 2 Howard Gardner used lesioning (destroying tissue in specific areas of the brain) to help him understand the multiple forms of intelligence.

Bullet # 3 Lesioning studies have their limitations. There are not that many subjects available and there is no way that psychologists can control the location of the brain damage nor its severity. Neuroscientists often purposely damage brain structures in animals to help them understand behavior. They usually use a high frequency electric current attached to a needle to destroy specific structures in the brain. Sometimes they also implant electrodes at specific sites in the brain.

Electrical Stimulation of the Brain

- ESB involves sending a weak electrical current into a brain structure in order to stimulate it
- The current mimics brain wave voltage
- Most ESB research is done on animals

Slide # 35

Bullet # 1 In ESB, a current is delivered using an electrode. The current is somewhat different than the one used in lesioning.

Bullet # 2 The current does not exactly duplicate normal electrical energy emitted from the brain, but it is a close approximation.

Bullet # 3 Nearly all ESB research uses animals, although sometimes ESB is used on humans when they are performing surgery. Nearly always in these cases the patient is awake so that they can provide feedback to the surgeon. Only local anesthetics are used. Brain tissue by itself feels no pain.

Brain Imaging Techniques

- CT (computerized tomography) scans
- PET (positron emission tomography) scans
- MRI (magnetic resonance imaging) scans

Slide # 36

In recent years, many new technologies have been developed to examine the human brain. Years ago the only way to look closely at a brain was by taking one from a cadaver. Technology today allows us to investigate both the structure and activity of the brains of live patients. There are three major types of scans commonly used (see next slides for a description of each).

The CT Scan



- Computerized tomography (CT) scan: a computer-enhanced x-ray of brain structure
- Assembling the images
- CT/least expensive procedure

Slide # 37

Bullet # 1 A CT scan is really a computer-enhanced x-ray of brain structure. Many x-rays are shot from different angles. A computer then creates a vivid image of a horizontal “slice” of the brain.

Bullet # 2 The entire brain can be seen by assembling a series of images of these “slices.”

Bullet # 3 The CT scan is both the least expensive and the most widely used brain imaging technique (especially for research).

Special note: The drawing in this slide shows an x-ray beam and x-ray detector rotating around the patient’s head.

Image From a CT Scan



Slide # 38

CT scans look for abnormalities in the brain. They are also used in diagnosing different forms of mental illness. The drawing in this slide shows a CT scan of a brain with a tumor (the tumor is shown in red and yellow on the right side of the drawing).

PET Scans

- Positron emission tomography (PET) scan
- Radioactive chemicals are used as markers
- Provides a color-coded map of the brain



Slide # 39

Bullet # 1 PET scans are often more valuable than CT scans. CT scans only show brain structure. PET scans map out actual activity in the brain.

Bullet # 2 In a PET scan, radioactive chemicals are introduced into the brain. They serve as markers of blood flow or activity in the brain, which in turn is monitored by an x-ray.

Bullet # 3 A PET scan produces a kind of color-coded map showing the areas of the brain that become active when patients work on math problems, paint a picture, play a musical instrument, or engage in other types of behaviors or activities.

The drawing in this slide represents a PET scan of a person who is in the process of working out a language task.

MRI Scans

- Magnetic resonance imaging (MRI) scan uses magnetic fields, radio waves, and computerized enhancement
- Much more detailed than a CT scan



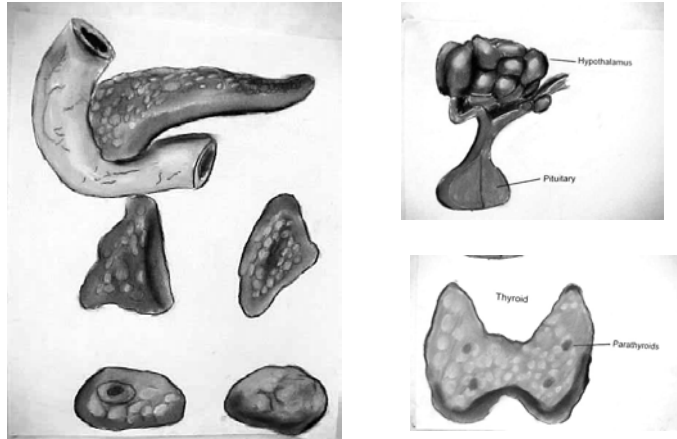
Slide # 40

Bullet # 1 An MRI scan uses a combination of techniques (including radio waves and magnetic fields) to create a computer model of brain functions.

Bullet # 2 Unlike CT scans, MRI scans can produce a three-dimensional image of the brain.

The drawing in this slide shows a vertical view of the left side of a person's brain.

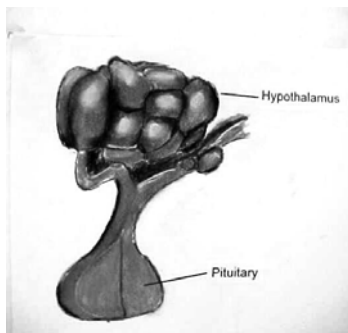
The Endocrine System



Slide # 41

Neurons are not the only cells that use chemicals to communicate with one another in ways that affect behavior. Another class of cells with this same ability is called the endocrine system. The endocrine system regulates and manages everything from physical growth to stress response. The cells of the endocrine organs or glands communicate by producing chemicals called hormones. These hormones operate similarly to the way neurotransmitters operate in the brain. Endocrine glands secrete hormones into the bloodstream, which then carries them throughout the body.

The Pituitary Gland



- Master gland of the body
- It contains 3 lobes
- The pituitary regulates metabolism by stimulating other glands

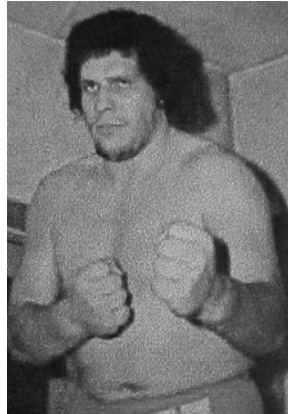
Slide # 42

Bullet # 1 Under the direction of the hypothalamus in the brain, the pituitary gland acts as the master gland of the body. It is located near the midbrain.

Bullet # 2 The pituitary is divided into lobes. Each lobe secretes a number of hormones into the bloodstream. The hypothalamus controls the amount of hormones in the bloodstream and sends out messages to the pituitary so that it can correct imbalances.

Bullet # 3 Hormones are chemical messages that tell the body what to do. The word “hormone” comes from a Greek word meaning “to stir up or excite.” Hormones carry messages to vital body organs. The pituitary regulates metabolism by stimulating other glands.

Anterior Lobe/Pituitary Gland



- Somatotrophic hormones
- Midget
- Dwarf
- Giant
- Acromegaly

Slide # 43

Bullet # 1 The anterior portion of the pituitary gland produces four major hormones. One of the most important of these is called the somatotrophic hormone, which regulates growth.

Bullet # 2 If a person's body produces too little of the somatotrophic hormone during childhood, the person becomes a midget. Midgets are perfectly formed and evenly proportioned; they are just very small people.

Bullet # 3 Sometimes errors in somatotrophic hormone balances produce dwarfs. A dwarf is someone whose arms and legs are short but whose body is of normal proportions. One of the most famous dwarfs was Tom Thumb. He was born Charles Sherwood Stratton in 1830 in Bridgeport, Connecticut. His parents were of normal size. He ended up in the circus as an 11 year-old and quickly became popular. Circus owner P.T. Barnum taught him how to sing, dance, mime, and act. Tom Thumb traveled around the world and even met Abraham Lincoln and Queen Victoria. He wed Lavinia Warren in 1863. She too was a dwarf. As an adult, Tom Thumb was forty inches tall and weighed seventy pounds.

Bullet # 4 A giant is someone whose somatotrophic hormones have kicked into overdrive. Andre the Giant (pictured above) was a famous wrestler. He was seven feet four inches tall and weighed 520 pounds. He also suffered from a condition known as acromegaly. He died in 1992.

Bullet # 5 Acromegaly causes the tissue over the bones to enlarge, making a person's face look massive. It also makes the hands and feet excessively large.

Justin



Slide # 44

Justin was a young man who suffered from a growth disorder: His pituitary gland produced too little somatotrophic hormone. He was a dwarf, weighing only 40 pounds and standing about 40 inches tall. He had trouble seeing and was confined to a wheelchair. He also suffered from myxedema, which is an endocrine disorder that causes arrested growth in adulthood. His internal organs continued to grow but his skeletal structure did not. He died at age sixteen. He was a tremendous source of inspiration to all who knew him.

Other Pituitary Hormones

- TSH (thyroid stimulating hormone)
- ACTH (adrenocorticotrophic hormone)
- Gonadotrophic hormone

Slide # 45

Bullet # 1 TSH regulates the size and activity of the thyroid gland.

Bullet # 2 ACTH triggers and manufactures secretions which go to the adrenal glands.

Bullet # 3 Gonadotrophic hormones control growth development and functioning of the gonads. They are essential in ova maturation, sperm production, and the development of secondary sexual characteristics.

Posterior Lobe Hormones

- ADH (anti-diuretic hormone)
- Oxytocin

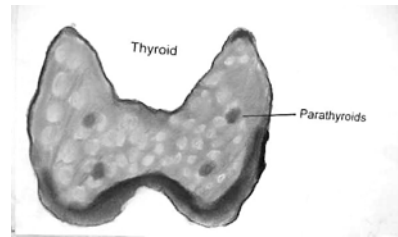
Slide # 46

Bullet # 1 ADH regulates the balance of water in the body. It stimulates the kidneys to retain water by returning it to the blood.

Bullet # 2 Oxytocin stimulates the smooth muscles found in the walls of internal organs. It is also the hormone that triggers labor in pregnant women.

The Thyroid Gland

- Largest gland in the endocrine system trachea and larynx
- Located at the junction of the trachea and larynx
- Produces thyroxine



Slide # 47

Bullets # 1–2 The thyroid gland is the largest gland in the endocrine system. It is located in the neck.

Bullet # 3 It produces a hormone called thyroxine, which is necessary for normal thyroid activity. It affects all tissues by causing certain chemical reactions. The thyroid regulates body metabolism, which is the rate at which cells in the body produce energy. If there is an oversupply of thyroxine, a person becomes hyperactive. If there is an undersupply, the person feels lazy and sluggish.

Thyroid Disorders

- Cretinism
- Myxedema
- Goiter

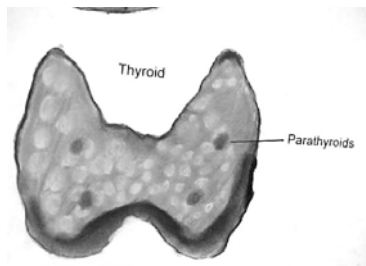
Slide # 48

Bullet # 1 Cretinism appears as arrested growth coupled with mental retardation. Victims have lower heart rates and yellowish, dry skin.

Bullet # 2 Myxedema causes a lack of growth in adulthood. Justin, the young man whose picture you saw a few slides back, suffered from this disorder (among others).

Bullet # 3 Goiter is actually caused by a diet deficient in iodine. The thyroid gland enlarges in an attempt to make up for the lack of iodine. Swelling occurs right in the middle of the neck. This disorder is much rarer today than in the past, since most people now get a sufficient amount of iodine in their diet.

The Parathyroids



- The four smallest glands in the endocrine system
- They regulate the body's calcium and phosphorus balances
- Tetany

Slide # 49

Bullet # 1 The parathyroids are the four smallest glands in the endocrine system. They are located within the the thyroid gland itself.

Bullet # 2 The parathyroids regulate the body's calcium level and phosphorus balances. The parathyroids are important for proper muscle contractions and regulation of the amount of calcium in the bloodstream.

Bullet # 3 Tetany is a condition caused by too low a calcium level. People with tetany can experience muscle spasms and cramps. The condition can be remedied by taking calcium supplements.

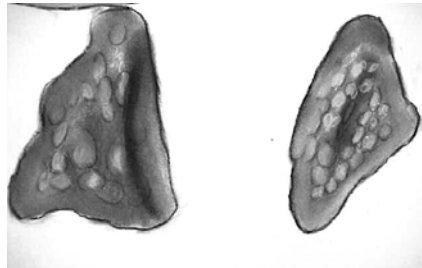
The Thymus Gland

- Located behind the breastbone
- Its function is not clearly understood
- Immune system

Slide # 50

Bullets # 1–3 The thymus gland is located directly underneath the breastbone, right next to the heart. It grows during childhood, but by adolescence it starts to shrink. In adults, it's very small. Its function is not clearly understood. However, it does appear that the thymus gland seems to play an important role in the body's immune system.

The Adrenal Gland



- Located on top of each kidney
- Composed of the adrenal cortex and the adrenal medulla
- Steroids, cortisone, aldosterone

Slide # 51

Bullet # 1 The adrenal glands are the “emergency glands” of the endocrine system. Adrenal glands are located atop each kidney.

Bullet # 2 The adrenal glands are composed of a cortex and a medulla, each of which produces different hormones.

Bullet # 3 The adrenal cortex produces three hormones: steroids, which affect strength and endurance; aldosterone, which maintains the body’s water balance; and cortisone, which controls the metabolism of carbohydrates, fats, and proteins. Cortisone also helps when a person is under stress.

The Adrenal Medulla



- Depends on the hypothalamus and the autonomic nervous system for regulation
- Epinephrine/ adrenaline
- Noradrenalin

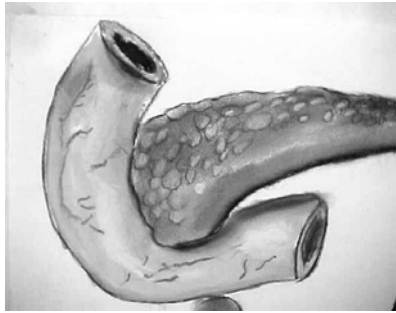
Slide # 52

Bullet # 1 The adrenal medulla produces critical hormones when the body is under stress. A message is sent from the hypothalamus in the brain to the autonomic nervous system, which in turn sends a chemical message to the adrenal glands.

Bullet # 2 Epinephrine (also known as adrenaline) is an emergency hormone. It increases heart rate, causes blood pressure to rise, and makes a person's breathing become labored. It also represses digestion.

Bullet # 3 Noradrenalin is a hormone that returns the body to normal. The parasympathetic portions of the autonomic nervous system regulate this hormone.

The Pancreas

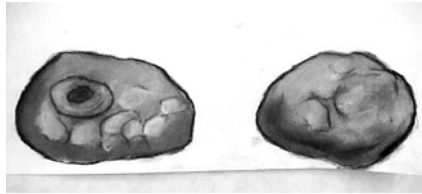


- Produces insulin and glucagon to control sugar metabolism
- Diabetes

Slide # 53

Bullets # 1–2 The pancreas helps facilitate the entry of blood glucose (sugar) into the cells that are involved with the regulation of blood sugar. Insulin must be present in the blood for the tissues to use carbohydrates. Lack of insulin causes a person to become diabetic. Some diabetics must give themselves daily injections of insulin and test their blood on a regular basis. Childhood obesity is often associated with diabetes. The disease can also appear among the elderly.

Ovaries and Testes



- Testes in males, ovaries in females
- Testosterone
- Estrogen and progesterone

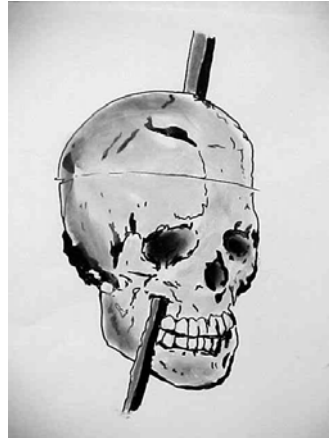
Slide # 54

Bullet # 1 There are two types of sex glands: testes in males, and ovaries in females. Testes produce sperm and the male sex hormone testosterone. A woman's ovaries produce eggs and the female hormones estrogen and progesterone. Each sex also has small amounts of the other's hormones present in their body: females have low levels of testosterone and males have low levels of estrogen and progesterone.

Bullet # 2 Testosterone is extremely important in the physical development of males even in the prenatal period, when it helps decide the sex of the fetus. In adolescence, testosterone is important for muscle growth, bone development, and the development of secondary sexual characteristics.

Bullet # 3 Estrogen and progesterone are important in the development of female sex characteristics. These two hormones also regulate a woman's reproductive cycle.

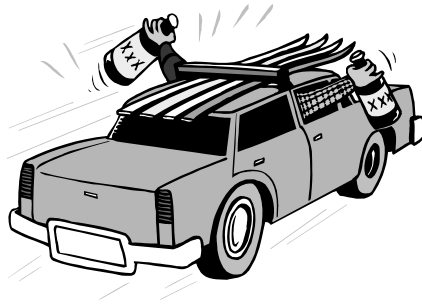
Brain Injuries



Slide # 55

Injuries to the brain can be categorized either as “diffuse” or “specific.” Diffuse damage has a generalized, negative effect on the brain. Cerebral arteriosclerosis is an example of diffuse damage. According to the National Institute of Neurological Disorders and Stroke, cerebral arteriosclerosis is “the result of thickening and hardening of the walls of the arteries in the brain. Symptoms of cerebral arteriosclerosis include headache, facial pain, and impaired vision.” Specific damage is usually caused by an external source. In this next section, we will examine various forms of brain injuries.

Brain Trauma



- A physical accident where the head receives a severe blow.
- Auto accidents, sports injuries

Slide # 56

Bullets # 1–2 Brain trauma may result from various physical accidents in which the head receives a severe blow. Automobile and motorcycle accidents frequently cause head injury. Playground accidents and sports injuries can also cause brain trauma.

Types of Head Trauma

- Concussion
- Contusion
- Laceration

Slide # 57

No specific notes. See next slides.

Concussion



- Temporary loss of consciousness
- Causes no permanent damage to skull or brain tissue
- Flaccid paralysis
- Symptoms

Slide # 58

Bullet # 1 A concussion is caused by a severe blow to the head. Typically, the person temporarily loses consciousness for several minutes. Upon awakening, he/she often remembers very little about what led up to the event that caused the concussion.

Bullet # 2 A single concussion usually causes no permanent damage to the skull or brain tissue. However, once someone gets a concussion they become more susceptible to future concussions. Receiving several concussions over the course of one's life can lead to deterioration of brain function, problems with equilibrium, severe headaches, and other maladies.

Bullet # 3 The best example of a concussion is when a boxer gets knocked out. The fighter receives a hard blow to the head, then falls to the floor, often hitting his head again. An unconscious boxer typically exhibits a condition known as flaccid paralysis, in which there is some reflexive movement of the arms and legs. After regaining consciousness, the boxer is often disoriented. Special note: Head punches sustained in a boxing match cause the brain to actually collide with the skull. The brain is temporarily displaced toward the back of the skull.

Bullet # 4 Victims of concussions often suffer from headaches, experience dizziness, have difficulty concentrating, and may even experience memory loss.

Concussion



Slide # 59

Many athletes involved in contact sports suffer from concussions. This is a painting of former Dallas Cowboys quarterback Troy Aikman. He suffered four major concussions while he was playing professional football. His injuries eventually made him retire from the sport.

Contusions

- Actual bruising of neural tissue
- May cause a coma
- Loss of speech, convulsions, disorientation, delusions

Slide # 60

Bullet # 1 A contusion is much more serious than a concussion. With a contusion, there is actual damage or bruising to neural tissue.

Bullet # 2 In the most severe cases a person may lapse into a coma that could last days, even weeks.

Bullet # 3 The patient will experience nearly all of the symptoms of someone who has had a concussion, but because the injury is much more severe he/she may lose the ability to talk. He/she may have convulsions, be disoriented, some even become delusional and paranoid. Other victims of contusions become profane and belligerent.

Lacerations

- The most serious of brain injuries
- A foreign object such as a bullet enters the skull
- Brain tissue is destroyed



Slide # 61

Bullets # 1–2 The most serious brain injuries are caused when a foreign object penetrates the brain. The effects of such injuries depend upon the exact site of the brain damage. Damage to some sites in the brain can cause death, while damage to other sites can cause sensory changes or severe, debilitating impairment of cognitive function. A case was reported many years ago in which a man was shot in the head five times by an unknown assailant. The man lived, and after his external wounds healed he was able to resume normal functioning— still carrying several bullets inside his brain.

Special note: The drawing above depicts the attempted assassination of President Ronald Reagan by John Hinckley Jr. The president was shot in the chest and the bullet lodged very near his heart. He survived. His press secretary, James Brady, was hit a number of times in the head and suffered brain damage as a result.

James Brady

- Reagan's press secretary
- Shot March 30, 1981
- Wound to the head
- Brady Bill



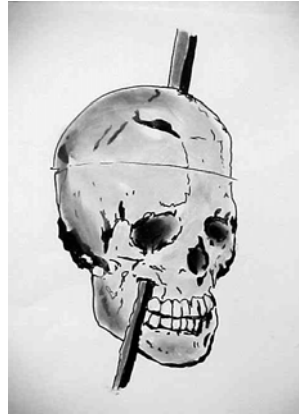
Slide # 62

Bullets # 1– 2 When John Hinckley attempted to assassinate President Ronald Reagan, his bullets also hit two policemen, a Secret Service agent, and Reagan's press secretary, James Brady.

Bullet # 3 After Mr. Brady recovered from his wounds, he and his wife spent countless hours lobbying for stronger gun control laws. On November 30, 1993, President Bill Clinton signed the Brady Bill, which required a national waiting period for and background checks of all handgun purchasers. Mr. Brady today serves as vice chairman of The National Head Injury Foundation. He is also the vice chairman of The National Organization on Disability. Though he retained higher-thinking functions, the injury caused some speech and physical impairment. Mr. Brady will have to struggle with these impairments for the rest of his life.

Cerebral Laceration

- The case of Phineas Gage



Slide # 63

Psychologists can learn a great deal about brain function when tragedy strikes. They try to make connections between the damaged part of the brain and a person's behavior, as illustrated by one famous case study. Phineas Gage lived in the mid-19th century and was foreman of a railroad crew. He was even-tempered, well-respected, and considered a good boss. In 1848, a horrific accident occurred. Gage and his crew were about to explode some dynamite to clear a path for the tracks. Gage was using a tamping iron to pack down the dynamite, but the iron caused a spark which ignited a premature explosion. The force of the blast drove the iron through Gage's face and out his skull. The tamping iron weighed over 13 pounds and was 3 feet long. Gage was an extraordinarily strong man and managed to survive the accident. He lived for 12 more years, but his personality changed dramatically. He became fitful, irreverent, and argumentative. His skull and the tamping iron are in a museum today.

Vascular Accidents

- Injuries to brain tissue resulting from blockage or breaking of cranial blood vessels
- Cerebral thrombosis/stroke
- Strokes are the most common CVAs
- Effects

Slide # 64

Bullet # 1 Vascular accidents result from either a blockage or breakage of cranial blood vessels, which in turn cause damage to brain tissue.

Bullet # 2 Cerebral thrombosis occurs when a clot forms and blocks the circulation of blood to the brain. The parts of the brain served by blood vessels that have been blocked by the clot cannot be nourished and waste products cannot be eliminated. As a result, brain cells die. Cerebral thromboses are also known as strokes.

Bullet # 3 Strokes are the most common of cerebrovascular accidents (CVAs).

Bullet # 4 CVAs can cause hemiplegia (paralysis of half of the patient's body or one arm or leg). Speech and motor skills (such as walking) may also be affected.

Cerebral Hemorrhages

- Blood vessels in the brain rupture (aneurysm)
- Blood spills directly onto the brain tissue
- Coma, convulsions

Slide # 65

Bullet # 1 In a cerebral hemorrhage, a blood vessel in the brain actually ruptures. This usually happens when the blood vessel expands out like a balloon. The expansion causes the wall of the blood vessel to become thinner, and therefore weaker. When a blood vessel in the brain bursts, it is called an aneurysm.

Bullet # 2 When an aneurysm occurs, blood spills directly onto brain tissue, damaging or destroying it.

Bullet # 3 Victims of cerebral hemorrhages often lapse into a coma, suffer convulsions, and may exhibit signs of neurological damage. Even if the patient survives, it remains likely that there will be severe impairment such as paralysis, mental confusion, or memory and speech difficulties.

Brain Injuries Resulting from Surgery



- Techniques for neurosurgery
- Transorbital lobotomy
- Early lobotomy procedures
- Closed standard lobotomy

Slide # 66

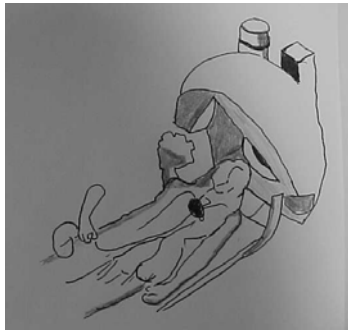
Bullet # 1 The drawing illustrates various neurosurgery techniques. The top method is known as transorbital lobotomy. It involves inserting a needle through the optical cavity, thus eliminating the necessity for drilling a hole through the skull to get at the brain.

Bullet # 2 The second drawing shows how early lobotomies were performed. The technique involved drilling through the skull, then inserting an instrument to cut a selected area of brain tissue.

Bullet # 3 A later modification of this technique used an electric needle to cauterize brain tissue (as shown in drawing 3).

Special note: Until the 1960s, prefrontal lobotomies were often used to control most violent offenders. It was believed at that time that the frontal lobes of the brain housed human aggression. Prefrontal lobotomies definitely controlled aggressive behavior, but they also put the patient into a vegetative state. Joseph Kennedy, Sr., the father of John, Robert, and Ted Kennedy, also had a daughter who suffered from mental impairment. Without his wife's permission or consent, he had her lobotomized .

New Neurosurgery Techniques



- A thin wire with a tiny magnet on its tip is inserted through the femoral artery into the brain
- Helmet-shaped overhead magnet
- Endovascular surgery

Slide # 67

Bullet # 1 One modern neurosurgery technique uses a wire with a tiny magnet on its tip, which is inserted into the femoral artery in the leg. (This is the same artery in the groin that doctors use when performing angioplasty, which is used to unplug clogged arteries in the heart.) The thin wire then is threaded all the way up into the brain.

Bullet # 2 Aided by a helmet-shaped magnet overhead, the physician guides the wire into the brain to reach swollen or blocked blood vessels. This type of surgery used to involve drilling a hole in the skull. Today doctors try to work on the brain without opening up the skull.

Bullet # 3 This technique is called endovascular surgery. It is not as easy to unclog arteries in the brain as it is in the heart. Brain vessels are smaller and more twisted, and they float in brain fluid. This makes endovascular surgery a difficult task: it has been described as “trying to push a wire through a bowl of jello.” There are only about 300 endovascular brain specialists in the United States.

Brain Infections

- Parkinson's disease
- Meningitis
- Encephalitis

Slide # 68

No special notes. Information about each infection in the slides to follow.

Parkinson's Disease



- Degenerative CNS disorder
- Rigidity, tremors, gait difficulties
- Onset
- Gender

Slide # 69

This is a portrait of actor Michael J. Fox, who has Parkinson's disease. He has become a spokesman for the disease and devotes many hours to a crusade to help find a cure for Parkinson's disease.

Bullet # 1 Parkinson's disease is a degeneration of the the central nervous system (CNS). It afflicts about one million Americans. The risk for contracting Parkinson's disease increases with age.

Bullet # 2 People who suffer from Parkinson's experience some if not all of the following symptoms: uncontrolled body movements, rigidity, tremors, and other movement difficulties like walking (gait).

Bullet # 3 The onset of Parkinson's usually occurs in people around 50 years of age or older. On rare occasions, it may develop as early as 30 or 40.

Bullet # 4 Parkinson's affects men and women equally.

Two Types of Parkinson's Disease



- Idiopathic PD (primary)
- Secondary PD (trauma, cerebrovascular accidents, tumor, drug-induced)
- Stages
- Causes

Slide # 70

This is a picture of Muhammad Ali, one of the greatest boxers of all time. He told his critics that he could “float like a butterfly and sting like a bee.” That was true in his early years. As he got older and heavier, he slowed down quite a bit and adopted a technique that he called “rope a dope” where he would allow his opponent to pound him while he tried to protect his head, while leaning on the ropes. When his opponent began to tire from all the punching, Ali would spring into action and knock him out. Unfortunately, he still ended up taking quite a few shots to the head. Today he suffers from Parkinson's, likely due to the head trauma he received during his boxing career.

Bullets # 1–2 There are two types of Parkinson's Disease: idiopathic (or primary) and secondary. Idiopathic PD has no known recognizable cause. Secondary PD may result from head injury or trauma, a tumor, or even a cerebrovascular accident (CVA). It may even be drug-induced.

Bullet # 3 Patients with both types of PD are classified into states (early, moderate, or advanced) based on the speed and progression of the disease. There is no known cure.

Bullet # 4 Parkinson's Disease is caused by the destruction of pigmented brain cells, which produce the neurotransmitter dopamine. Dopamine deficiency can cause loss of muscle tone and of voluntary muscle control.

Meningitis

- An infection of the cerebrospinal fluid and the lining of the brain
- It spreads very rapidly, and can cause brain damage and kill in less than 24 hours
- Rifampin

Slide # 71

Bullet # 1 Meningitis is an infection of the fluid and lining of the brain. Blood infections are fought off by white blood cells. In spinal fluid, there are no white blood cells; consequently, there is nothing to fight off the infection.

Bullet # 2 Once an infection begins, it spreads very rapidly throughout the body. Victims of meningitis have about a 24-hour window to seek immediate medical help. The disease can cause brain damage, personality changes, and even death.

Bullet # 3 Sometimes a drug called Rifampin is given as a preventive measure to people who may have come in contact with someone who has meningitis.

Symptoms of Meningitis

- In adults: vomiting, headaches, drowsiness, seizures, high fever, joint pain, stiff neck
- In children: arching back and neck, blank stare, refusal to eat, cold hands and feet, vomiting
- Diagnosis/spinal tap

Slide # 72

Some bacteria that cause meningitis can also cause septicemia (blood poisoning). Septicemia also develops very rapidly. Often a rash develops along with the septicemia.

Bullet # 3 To diagnose meningitis, a procedure called a spinal tap is used. The normal treatment for meningitis involves administering huge doses of antibiotics intravenously.

Encephalitis

- Inflammation of the brain by a virus
- Herpes simplex virus (HSV)
- Transmission
- Milder forms of encephalitis

Slide # 73

Bullet # 1 Encephalitis literally means “inflammation of the brain.” It is caused by a virus. Many different kinds of viruses can cause encephalitis.

Bullet # 2 One of the most dangerous viruses that can cause encephalitis is the herpes simplex virus. This is the same virus that causes cold sores around the mouth. When it attacks the brain, it can be fatal: one half of those affected die. Fortunately, HSV encephalitis is very rare.

Bullet # 3 Some forms of encephalitis are transmitted by insects. Lately there has been some real concern about the spread of West Nile Virus, which is transmitted to humans by mosquitoes which have drawn blood from infected birds.

Bullet # 4 Milder forms of encephalitis can follow childhood illnesses such as measles, mumps, chicken pox, rubella, mononucleosis, and even meningitis. Encephalitis sometimes even follows syphilis or Lyme disease.

Symptoms of Encephalitis

- Fever, headache, poor appetite, loss of energy
- Severe symptoms also include nausea, vomiting, stiff neck, pupils of different sizes, personality changes, seizures, problems with speech and hearing, double vision, memory loss, and coma.

Slide # 74

Most people with encephalitis usually make a full recovery. In a small percentage of the cases, the swelling of the brain can lead to permanent brain damage and lasting complications like learning disabilities, speech problems, and memory loss. Physical and speech therapy are often needed. The treatment also involves the use of anti-viral medications.

Preventing Encephalitis

- Proper childhood immunizations
- Avoiding insect bites
- Eliminate standing water around the house

Slide # 75

Bullet # 1 Encephalitis cannot be prevented entirely, but proper childhood immunizations certainly help. Children should also avoid contact with anyone who has encephalitis.

Bullet # 2 In areas where encephalitis is transmitted by insect bites (especially by mosquitoes), children should avoid being outside in early morning and early evening hours, when mosquitoes are most active. They should also wear long sleeve shirts and pants and use insect repellent.

Paresis

Syphilis of the brain

Slide # 76

General paresis (or syphilis of the brain) is rare in this day and age. With the advent of penicillin in 1941, doctors were able to eliminate this type of infection if they could catch it early in the first stage.

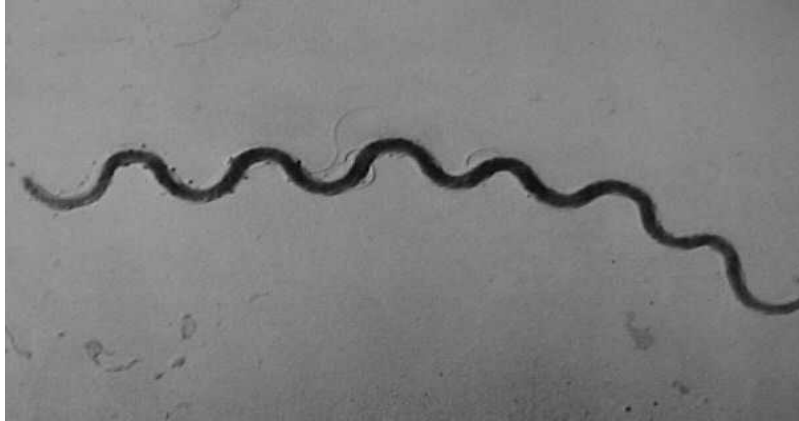
Causes of Paresis



Slide # 77

Paresis occurs most frequently in men between the ages of 35 and 50. It is considered a sexually transmissible infection. It can be transmitted through normal sexual intercourse, or oral/genital contact. General paresis typically begins about 15–20 years after the original syphilis infection. Those at risk for developing paresis include people who have had a previous syphilis infection or an infection that resulted from another sexually transmitted disease such as gonorrhea.

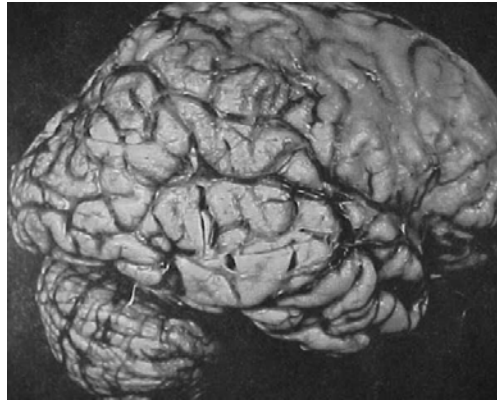
Spirochete



Slide # 78

With syphilis, a corkscrew organism called a spirochete invades a victim's body through a cut or break in the skin or through the mucous membranes in the mouth or genital areas. Syphilis is a sexually transmissible disease; it can also be congenital. Most babies born to syphilitic mothers are stillborn, while others are born blind.

The Stages of Syphilis



Slide # 79

This photo shows what the brain looks like at the last stage of syphilis (general paresis). Syphilis is called “the great imitator” because it mimics a variety of other diseases. It is also a slow killer, so many cases used to go undetected. Syphilis can be cured by a massive dose of penicillin. The disease used to be quite widespread: by 1900 it was estimated that one half of all Europeans had some of the symptoms of either syphilis or gonorrhea. There was no cure until the development of antibiotics in 1941.

Diagnosis

- Chancre (A small sore that appears on the lips or sex organs; disappears without treatment)
- Causes rashes, skin infections, flu-like symptoms, hair loss
- Diagnosis of cerebrospinal fluid

Slide # 80

Bullet # 1 Chancres often appear on sex organs, the lips, or any place a spirochete enters the body. This dime shaped sore—which is usually painless—will disappear even without any treatment

Bullet # 2 Secondary syphilis often imitates other diseases or infections. Skin rashes are not uncommon. Some sufferers from secondary syphilis come down with flu-like symptoms, while others even lose scalp hair.

Bullet # 3 Diagnosis of paresis or late syphilis is made with a spinal tap. At this stage, the infection can get into the cerebrospinal fluid and spread to the brain, causing permanent damage.

Symptoms of Paresis

- Pupil of eye does not respond to light
- Tremors of fingers, tongue, eyes
- Loss of motor control
- Shuffling gait
- Personality changes

Slide # 81

General paresis can also involve an occasional loss of consciousness, convulsions, depression, delusion, or a total loss of contact with reality. There may be increasing paralysis or delusions of grandeur. The damage that it does is irreparable. Paresis is also a slow killer: the disease has been compared to termites eating away at a house.

Nature vs. Nurture

- Heredity: the genetic transmission of characteristics from parents to offspring (nature)
- Nurture (environment and learning)
- Sir Francis Galton
- John Watson

Slide # 82

Bullet # 1 The question of the importance of nature versus nurture has been going on for generations. Heredity is something you cannot change. It is innate, inborn and unlearned.

Bullet # 2 Nurture, on the other hand, involves one's environment and learning; it is subject to constant change. Nurture includes family, culture, and education.

Bullet # 3 Sir Francis Galton was one of the first psychologists to focus on the importance of heredity. In 1869 he published *Hereditary Genius*, a book in which he analyzed over 1000 families. He believed that success ran in families and therefore proved the importance of heredity.

Bullet # 4 John Watson, the founder of behaviorism, had a very different notion from Galton. He wrote, "Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—a doctor, lawyer, artist, merchant-chief, and yes even beggarman and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors." (Watson, 1930)

Genes and Behavior



- The basic units of heredity are the genes
- Genes are inherited

Slide # 83

Bullet # 1 Genes are reproduced and passed along from parent to child. Genes affect behavior through their role in building the physical structures of the body.

Bullet # 2 If your parents are both artistic, you may have inherited a gene that influences or contributes to your artistic skill, but it does not necessarily mean you will become an artist.

Special note: The photo above is of identical twin girls Katie and Megan.

Twin Studies



- Identical twins develop from a single fertilized egg (monozygotic) and share the same genes
- Twins reared in different environments

Slide # 84

Bullet # 1 One way to find out how important genetics is compared to environment is to study identical twins, who are formed from a single fertilized egg and share the same genes.

Bullet # 2 Much of the research that has been done to try to solve the age-old question of nature versus nurture involves studies of identical twins reared apart.

Special note: These are the same identical twins you saw in the previous slide, now 17 years old.

Fraternal Twins

- Develop from two fertilized eggs (dizygotic)
- Their genes are no more similar than those of siblings
- Twins grow up in same environment



Slide # 85

Bullets # 1–2 Fraternal twins come from two separate fertilized eggs. They are no more alike genetically than brothers and sisters. Identical twins are the same sex, but fraternal twins can be a boy and a girl.

Bullet # 3 Fraternal twins share the same environment (nurture) as identical twins, but unlike identical twins, they don't have exactly the same genes.

Special note: This is a photograph of Jenna and Misty, fraternal twins.

University of Minnesota Experiment

- Identical twins separated at birth and reared in different environments
- From phobias to hobbies
- Heredity may contribute more than we ever believed



Slide # 86

Bullet # 1 Jim Springer and Jim Lewis, identical twins who had been separated four weeks after they were born, reunited 48 years later. They discovered that they both had married and divorced women named Linda, and married second wives named Betty. They both named their first sons James Allan. They both drove the same model of blue Chevrolet. They both enjoyed woodworking and had built identical benches around trees in their backyards. They also often vacationed at the same beach at St. Petersburg, Florida. Both men had dogs named Toy. Both were police officers.

Bullet # 2 Twins separated at birth had similarities ranging from phobias to hobbies, bodily gestures, and even things a researcher studying the genetics of behavior would never think of looking for. For example, twin women who had been separated at birth each had a son who had won a statewide mathematics contest—one in Texas and the other in Wyoming.

Bullet # 3 The twin study research probably raises more questions than it answers. It does seem to suggest that heredity may be much more important a contributor than anyone knew.

Special note: This is a photo of Katie and Megan, the same twins you have seen in the previous slides. They were not separated at birth. They are both excellent students, and both are cheerleaders.

Hal and Jerry



Slide # 87

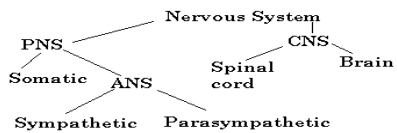
This is a photo of the author of this presentation (Hal) on the right and his twin brother (Jerry) on the left. Hal's son Nathan is in the middle. Both Hal and Jerry enjoy riding motorcycles, fishing, woodworking, and writing. They bought motorcycles on the same day without ever discussing it beforehand. They also both bought boats within one week of each other. Their children were all born in the months of January and October. When they were kids, they often switched places in their classes. Since their school was on a block schedule, Jerry took all of the math and science, and Hal took all of the English and history. In addition, Hal took most of the art classes and Jerry took most of the shop classes. Today Both men are teachers: Jerry teaches computer programming, Hal teaches psychology and history.

Biology & Behavior



Slide # 1

Diagram of the Nervous System



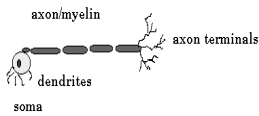
Slide # 2

Neurons



Slide # 3

Axons



- Thread-like extensions from the cell body
- Tube-like fibers that carry impulses away from the soma to the dendrites
- Myelin coating

Slide # 4

Multiple Sclerosis



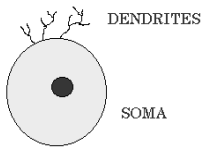
- MS destroys myelin sheaths of axons
- This can cause erratic and uncoordinated behavior

Slide # 5



Slide # 6

Dendrites



- Short, thin fibers that stick out from the cell body
- Dendrites receive impulses or messages from other neurons and send them to the cell body

Slide # 7

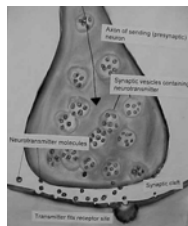
Characteristics of Neurons

- They cannot replace themselves
- Damage is permanent
- Threshold of excitation

Slide # 8

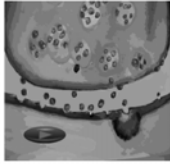
The Neuron Connection

- Synapse junction
- Neurotransmitters
- Open chemical "locks"
- Inhibition



Slide # 9

How a Neuron Fires



Slide # 10

Neurotransmitters

- Acetylcholine (memory, movement)
- Norepinephrine (memory, learning)
- Serotonin (sleep, appetite)
- Endorphins (inhibits pain)
- Dopamine (learning, emotions, movement)

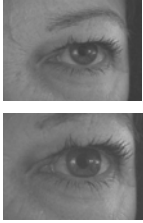
Slide # 11

Types of Neurons

- Ascending vs. descending tracts
- Afferent/Sensory neurons
- Efferent/Motor neurons
- Interneurons/Connecting neurons

Slide # 12

Voluntary vs. Involuntary



- Somatic nervous system (voluntary activities)
- Autonomic nervous system (involuntary activities)

Slide # 13

Divisions of the Autonomic Nervous System



- Sympathetic nervous system
- 1. Fight or flight
- 2. Speeds up heart rate/O² supply and blood pressure
- 3. It constricts some arteries, relaxes others

Slide # 14

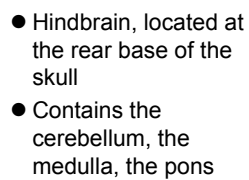
Parasympathetic Nervous System



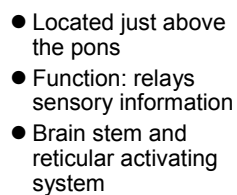
- Works to conserve energy
- Helps us recover from strenuous activity
- Reduces heart rate and blood pressure
- Returns us to a normal resting state

Slide # 15



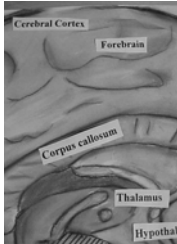


Slide # 17



Slide # 18

The Forebrain



- The hindbrain and forebrain compose the brain's central core
- Thalamus (information relay)
- Hypothalamus (motivation, emotion)
- Higher-thinking processes

Slide # 19

Higher-Thinking Processes



- Cerebral cortex
- Cerebrum

Slide # 20

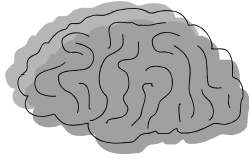
The Limbic System

- Found in the core of the forebrain
- It has a number of different parts:
 1. Thalamus
 2. Hypothalamus
 3. Amygdala
 4. Hippocampus

Slide # 21

Hemispheres of the Brain

- The cerebrum has two hemispheres
- The corpus callosum



Slide # 22

Two Hemispheres

left

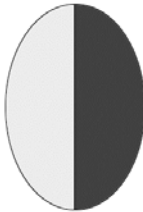
verbal

mathematical

analytical

rational

logical



right

nonverbal

spatial

holistic

emotional

intuitive

Slide # 23

Righthanded vs. Lefthanded



- Handedness—a preference for using one hand
- Not an absolute
- 90% of people in the U.S. are righthanded
- Theories: environmental vs. genetic

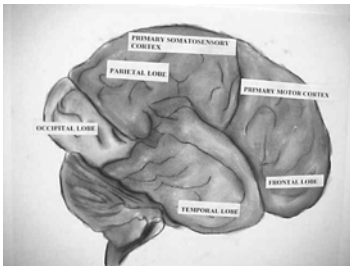
Slide # 24

Problems Associated With Being a Lefty

- Autism and dyslexia
- Schizophrenia
- Mental retardation
- Alcoholism
- Life expectancy

Slide # 25

Lobes of the Brain



Slide # 26

Lobes and Their Functions

- Frontal: planning of movements, working memory
- Temporal: hearing, advanced visual processing, memory
- Occipital: vision
- Parietal: body sensations
- Primary motor cortex: fine motor control

Slide # 27

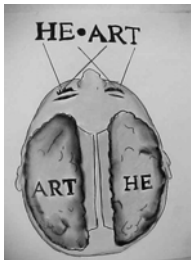
Split-Brain Surgery

- Pioneered by Roger Wolcott Sperry 1913–1994
- Used to correct epileptic seizures



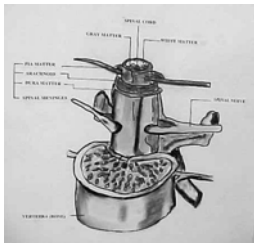
Slide # 28

Side Effects



Slide # 29

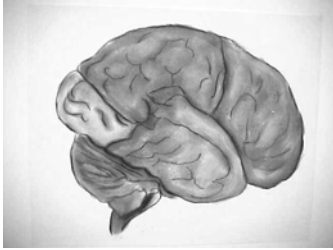
The Spinal Cord



- Dura matter
- Arachnoid
- Pia matter
- Cerebrospinal fluid
- Gray vs white matter

Slide # 30

Looking Inside the Brain



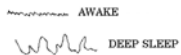
Slide # 31

Techniques Used to Look Inside the Brain

- Electrical recordings
- Lesioning
- Electrical stimulation
- Brain imaging

Slide # 32

Electrical Recordings



Electro-
encephalograph
(EEG)

Hans Berger
Brainwave patterns

Slide # 33

Lesioning



- Brain tumors, strokes, head injuries all cause brain damage
- H. Gardner, 1975
- Limitations/ experiments with animals

Slide # 34

Electrical Stimulation of the Brain

- ESB involves sending a weak electrical current into a brain structure in order to stimulate it
- The current mimics brain wave voltage
- Most ESB research is done on animals

Slide # 35

Brain Imaging Techniques

- CT (computerized tomography) scans
- PET (positron emission tomography) scans
- MRI (magnetic resonance imaging) scans

Slide # 36

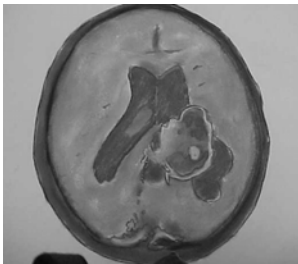
The CT Scan



- Computerized tomography (CT) scan: a computer-enhanced x-ray of brain structure
- Assembling the images
- CT/least expensive procedure

Slide # 37

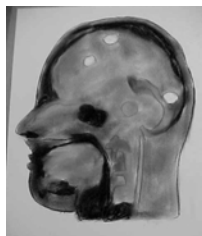
Image From a CT Scan



Slide # 38

PET Scans

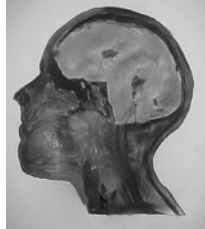
- Positron emission tomography (PET) scan
- Radioactive chemicals are used as markers
- Provides a color-coded map of the brain



Slide # 39

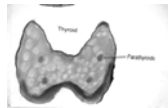
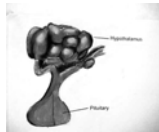
MRI Scans

- Magnetic resonance imaging (MRI) scan uses magnetic fields, radio waves, and computerized enhancement
- Much more detailed than a CT scan



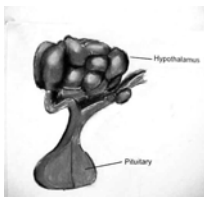
Slide # 40

The Endocrine System



Slide # 41

The Pituitary Gland



- Master gland of the body
- It contains 3 lobes
- The pituitary regulates metabolism by stimulating other glands

Slide # 42

Anterior Lobe/Pituitary Gland



- Somatotrophic hormones
- Midget
- Dwarf
- Giant
- Acromegaly

Slide # 43

Justin



Slide # 44

Other Pituitary Hormones

- TSH (thyroid stimulating hormone)
- ACTH (adrenocorticotrophic hormone)
- Gonadotrophic hormone

Slide # 45

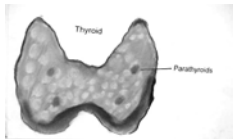
Posterior Lobe Hormones

- ADH (anti-diuretic hormone)
- Oxytocin

Slide # 46

The Thyroid Gland

- Largest gland in the endocrine system
- Located at the junction of the trachea and larynx
- Produces thyroxine



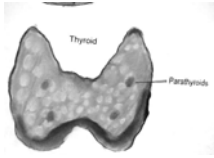
Slide # 47

Thyroid Disorders

- Cretinism
- Myxedema
- Goiter

Slide # 48

The Parathyroids



- The four smallest glands in the endocrine system
- They regulate the body's calcium and phosphorus balances
- Tetany

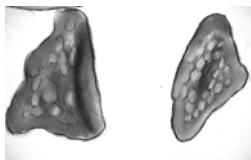
Slide # 49

The Thymus Gland

- Located behind the breastbone
- Its function is not clearly understood
- Immune system

Slide # 50

The Adrenal Gland



- Located on top of each kidney
- Composed of the adrenal cortex and the adrenal medulla
- Steroids, cortisone, aldosterone

Slide # 51

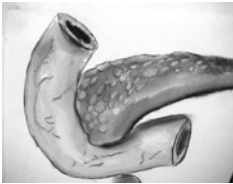
The Adrenal Medulla



- Depends on the hypothalamus and the autonomic nervous system for regulation
- Epinephrine/adrenaline
- Noradrenalin

Slide # 52

The Pancreas



- Produces insulin and glucagon to control sugar metabolism
- Diabetes

Slide # 53

Ovaries and Testes



- Testes in males, ovaries in females
- Testosterone
- Estrogen and progesterone

Slide # 54

Brain Injuries



Slide # 55

Brain Trauma



- A physical accident where the head receives a severe blow.
- Auto accidents, sports injuries

Slide # 56

Types of Head Trauma

- Concussion
- Contusion
- Laceration

Slide # 57

Concussion



- Temporary loss of consciousness
- Causes no permanent damage to skull or brain tissue
- Flaccid paralysis
- Symptoms

Slide # 58

Concussion



Slide # 59

Contusions

- Actual bruising of neural tissue
- May cause a coma
- Loss of speech, convulsions, disorientation, delusions

Slide # 60

Lacerations

- The most serious of brain injuries
- A foreign object such as a bullet enters the skull
- Brain tissue is destroyed



Slide # 61

James Brady

- Reagan's press secretary
- Shot March 30, 1981
- Wound to the head
- Brady Bill



Slide # 62

Cerebral Laceration

- The case of Phineas Gage



Slide # 63

Vascular Accidents

- Injuries to brain tissue resulting from blockage or breaking of cranial blood vessels
- Cerebral thrombosis/stroke
- Strokes are the most common CVAs
- Effects

Slide # 64

Cerebral Hemorrhages

- Blood vessels in the brain rupture (aneurysm)
- Blood spills directly onto the brain tissue
- Coma, convulsions

Slide # 65

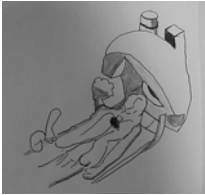
Brain Injuries Resulting from Surgery



- Techniques for neurosurgery
- Transorbital lobotomy
- Early lobotomy procedures
- Closed standard lobotomy

Slide # 66

New Neurosurgery Techniques



- A thin wire with a tiny magnet on its tip is inserted through the femoral artery into the brain
- Helmet-shaped overhead magnet
- Endovascular surgery

Slide # 67

Brain Infections

- Parkinson's disease
- Meningitis
- Encephalitis

Slide # 68

Parkinson's Disease



- Degenerative CNS disorder
- Rigidity, tremors, gait difficulties
- Onset
- Gender

Slide # 69

Two Types of Parkinson's Disease



- Idiopathic PD (primary)
- Secondary PD (trauma, cerebrovascular accidents, tumor, drug-induced)
- Stages
- Causes

Slide # 70

Meningitis

- An infection of the cerebrospinal fluid and the lining of the brain
- It spreads very rapidly, and can cause brain damage and kill in less than 24 hours
- Rifampin

Slide # 71

Symptoms of Meningitis

- In adults: vomiting, headaches, drowsiness, seizures, high fever, joint pain, stiff neck
- In children: arching back and neck, blank stare, refusal to eat, cold hands and feet, vomiting
- Diagnosis/spinal tap

Slide # 72

Encephalitis

- Inflammation of the brain by a virus
- Herpes simplex virus (HSV)
- Transmission
- Milder forms of encephalitis

Slide # 73

Symptoms of Encephalitis

- Fever, headache, poor appetite, loss of energy
- Severe symptoms also include nausea, vomiting, stiff neck, pupils of different sizes, personality changes, seizures, problems with speech and hearing, double vision, memory loss, and coma.

Slide # 74

Preventing Encephalitis

- Proper childhood immunizations
- Avoiding insect bites
- Eliminate standing water around the house

Slide # 75

Paresis

Syphilis of the brain

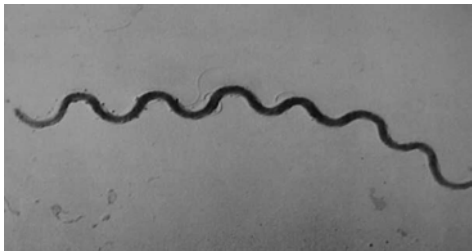
Slide # 76

Causes of Paresis



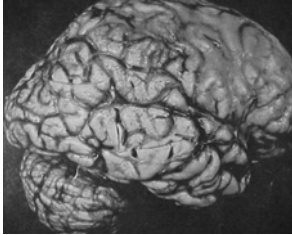
Slide # 77

Spirochete



Slide # 78

The Stages of Syphilis



Slide # 79

Diagnosis

- Chancre (A small sore that appears on the lips or sex organs; disappears without treatment)
- Causes rashes, skin infections, flu-like symptoms, hair loss
- Diagnosis of cerebrospinal fluid

Slide # 80

Symptoms of Paresis

- Pupil of eye does not respond to light
- Tremors of fingers, tongue, eyes
- Loss of motor control
- Shuffling gait
- Personality changes

Slide # 81

Nature vs. Nurture

- Heredity: the genetic transmission of characteristics from parents to offspring (nature)
- Nurture (environment and learning)
- Sir Francis Galton
- John Watson

Slide # 82

Genes and Behavior



- The basic units of heredity are the genes
- Genes are inherited

Slide # 83

Twin Studies



- Identical twins develop from a single fertilized egg (monozygotic) and share the same genes
- Twins reared in different environments

Slide # 84

Fraternal Twins

- Develop from two fertilized eggs (dizygotic)
- Their genes are no more similar than those of siblings
- Twins grow up in same environment



Slide # 85

University of Minnesota Experiment

- Identical twins separated at birth and reared in different environments
- From phobias to hobbies
- Heredity may contribute more than we ever believed



Slide # 86

Hal and Jerry



Slide # 87

Name _____ Date _____ Period _____

Activity #1

Heredity
Instinctive
Learned
Identical Twins
Fraternal Twins

Genes
Behavior
Environment
Dizygotic
Monozygotic

Sir Francis Galton
Nature
Nurture
John Watson

Heredity and Environment

1 _____ determine(s) what you could be, and 2 _____ define(s) the final product. People often argue about whether human behavior is 3 _____ (due to heredity) or 4 _____ (due to environment). 5 _____ is the genetic transmission of characteristics from parents to their offspring. In the “nature vs. nurture question,” 6 _____ refers to environmental factors such as family, culture, education, and individual experiences; 7 _____ refers to the characteristics that a person inherits—his or her biological makeup.

Genes build and modify the body’s physical structures, which then interact with their environment to produce 8 _____. One way to find out whether a trait is inherited is to study twins. 9 _____ develop from a single fertilized egg (thus they are called 10 _____) and share the same genes.

11 _____ develop from two fertilized eggs (thus, 12 _____), and their genes are no more similar than those of brothers and sisters.

13 _____ was one of the first modern-day psychologists to stress the importance of genetics in the modern era. He found that success ran in families and concluded that heredity was the cause. Other psychologists such as 14 _____ emphasized the importance of the environment in a child’s development.

Name _____ Date _____ Period _____

Activity #1

Heredity
Instinctive
Learned
Identical Twins
Fraternal Twins

Genes
Behavior
Environment
Dizygotic
Monozygotic

Sir Francis Galton
Nature
Nurture
John Watson

Heredity and Environment

1 Genes determine(s) what you could be, and **2** environment define(s) the final product. People often argue about whether human behavior is **3** instinctive (due to heredity) or **4** learned (due to environment). **5** Heredity is the genetic transmission of characteristics from parents to their offspring. In the “nature vs. nurture question,” **6** nurture refers to environmental factors such as family, culture, education, and individual experiences; **7** nature refers to the characteristics that a person inherits—his or her biological makeup.

Genes build and modify the body’s physical structures, which then interact with their environment to produce **8** behavior. One way to find out whether a trait is inherited is to study twins. **9** Identical twins develop from a single fertilized egg (thus they are called **10** monozygotic) and share the same genes. **11** Fraternal twins develop from two fertilized eggs (thus, **12** dizygotic), and their genes are no more similar than those of brothers and sisters.

13 Sir Francis Galton was one of the first modern-day psychologists to stress the importance of genetics. He found that success ran in families and concluded that heredity was the cause. Other psychologists such as **14** John Watson emphasized the importance of the environment in a child’s development.

Name _____ Date _____ Period _____

Activity #2: Body and Behavior

Autonomic nervous system
Somatic nervous system
Endocrine system
Neurotransmitters
Pituitary gland

Synapse
Neuron
Hindbrain
Midbrain
Lobes

1. The _____ are the different regions of the cerebral cortex.
2. The _____ controls voluntary movement of the skeletal muscles.
3. The _____ uses hormones to transmit information to and from the brain.
4. The _____ is the small part of the brain above the pons that relays sensory information.
5. Internal biological functions are controlled by the _____.
6. The gap between individual nerve cells is the _____.
7. The _____ is the part of the brain that sustains the basic processes of life.
8. The _____ is the central control for the endocrine system.
9. The rate at which neurons fire is determined by _____.
10. The cells along which messages travel to and from the brain are known as _____.

Name _____ Date _____ Period _____

Activity #2: Body and Behavior

Autonomic nervous system
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Lobes

1. The lobes are the different regions of the cerebral cortex.
2. The somatic nervous system controls voluntary movement of the skeletal muscles.
3. The endocrine system uses hormones to transmit information to and from the brain.
4. The midbrain is the small part of the brain above the pons that relays sensory information.
5. Internal biological functions are controlled by the autonomic nervous system.
6. The gap between individual nerve cells is the synapse.
7. The hindbrain is the part of the brain that sustains the basic processes of life.
8. The pituitary gland is the central control for the endocrine system.
9. The rate at which neurons fire is determined by neurotransmitters.
10. The cells along which messages travel to and from the brain are known as neurons.

Name _____ Date _____ Period _____

Activity #3: The Endocrine System

1. In what way is the endocrine system like the nervous system?

2. What causes the “rush” people experience when doing something risky?

3. What are three ways in which hormones affect behavior?

4. How does the pituitary gland act as the “master gland”?

5. When a person is angry or frightened, how do the adrenal glands prepare the person for action?

Biology and Behavior

6. What is hypothyroidism and how does it make people feel?

 7. What do ovaries produce?

 8. How does testosterone affect males in adolescence?

 9. What is the difference between a hormone and a neurotransmitter?
-

Name _____ Date _____ Period _____

Activity #3: The Endocrine System

1. In what way is the endocrine system like the nervous system? Like the nervous system, the endocrine system is a communication system that sends information to and from the brain.
2. What causes the “rush” people experience when doing something risky? The “rush” comes from the hormone adrenaline or the epinephrine secreted by the endocrine system. Presence of adrenal hormones tells the body that there is an emergency situation that requires it to become very active.
3. What are three ways in which hormones affect behavior? (Students’ answers should include three of the five possible answers). A) Hormones affect the growth of bodily structures, affecting what a person can do physically. B) They affect metabolic processes, influencing the amount of energy a person has. C) Certain hormones are responsible for physical differences between boys and girls. D) Other hormones prepare the body for action during stressful situations. E) Hormones also act in the brain to directly influence mood and drive.
4. How does the pituitary gland act as the “master gland”? The pituitary gland secretes a large number of hormones, many of which control the output of hormones by other endocrine glands.
5. When a person is angry or frightened, how do the adrenal glands prepare the person for action? The adrenal glands release epinephrine and norepinephrine into the bloodstream, causing heartbeat and breathing to increase. Adrenal secretions

- and other changes help a person generate the extra energy needed to handle an emergency situation.
6. What is hypothyroidism and how does it make people feel? Hypothyroidism occurs when a person has too little of the hormone thyroxine. This condition makes people feel lazy and lethargic.
 7. What do ovaries produce? Ovaries produce eggs and the female hormones estrogen and progesterone.
 8. How does testosterone affect males in adolescence? In adolescence, testosterone is important for the growth of muscles and bone, along with the growth of male sex characteristics.
 9. What is the difference between a hormone and a neurotransmitter? A neurotransmitter is released right beside the cell that it is intended to excite or inhibit. A hormone is released into the blood, which diffuses it throughout the body.
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Biology and Behavior

Name _____ Date _____ Period _____

Multiple-Choice Questions The Brain and Biological Basis of Behavior

1. Which of the following statements about neurons is NOT true?
 - a. Neurons are the basic building blocks of the nervous system
 - b. There are three parts to each neuron
 - c. Neurons come in different shapes
 - d. Neurons are all the same length
 - e. At the end of each neuron is a synaptic knob
2. Which of the following about axons is NOT true?
 - a. Axons are threadlike extensions coming from the cell body
 - b. The axon fibers carry impulses to the cell body
 - c. Most axons in the brain are very short
 - d. Some axons, especially those in the PNS (Peripheral Nervous System), are very long
 - e. Many axons are covered with a myelin coating
3. Which disease is caused by the wearing away of the myelin coating?
 - a. Parkinson's Disease
 - b. Multiple Sclerosis
 - c. Meningitis
 - d. Encephalitis
 - e. Paresis
4. Which famous TV and movie personality suffers from Parkinson's disease?
 - a. Annette Funicello
 - b. Michael J. Fox
 - c. Troy Aikman
 - d. James Brady
 - e. Phineas Gage
5. Which of the following is NOT a neurotransmitter?
 - a. Acetylcholine
 - b. Norepinephrine
 - c. Serotonin
 - d. Dopamine
 - e. Dendrite

Biology and Behavior

6. Which part of the nervous system prepares us for “fight or flight”?
 - a. Sympathetic Nervous System
 - b. Peripheral Nervous System
 - c. Parasympathetic Nervous System
 - d. Central Nervous System
 - e. Somatic Nervous System
7. Which portion of the brain relates to our drive for hunger, thirst, and sex?
 - a. Hypothalamus
 - b. Pons
 - c. Cerebellum
 - d. Medulla
 - e. Cerebral Cortex
8. About what percentage of Americans are left-handed?
 - a. 50%
 - b. 7% – 8%
 - c. Less than 1%
 - d. 90%
 - e. 20%
9. Which of the following problems are NOT associated with being left-handed?
 - a. Autism
 - b. Dyslexia
 - c. Mental retardation
 - d. Life expectancy
 - e. Heart disease
10. Which psychologist pioneered split-brain surgery?
 - a. Sigmund Freud
 - b. Roger Sperry
 - c. Howard Gardner
 - d. James Brady
 - e. Alfred Adler
11. Which of the following is NOT a technique used to look inside the brain?
 - a. Electrical Recording
 - b. Lesioning
 - c. Electrical Stimulation
 - d. Brain Imaging
 - e. The Synaptic Knob

Biology and Behavior

12. Which of the following scans shows the activity of the brain by monitoring blood flow?
- a. A lobotomy
 - b. CT Scan
 - c. PET scan
 - d. EEG
 - e. Electrical Stimulation of Brain
13. Which is considered the master gland of the body?
- a. The Adrenal Gland
 - b. The Thymus Gland
 - c. The Pancreas
 - d. The Pituitary Gland
 - e. The Thyroid Gland
14. Which is the least serious type of head injury?
- a. Concussion
 - b. Contusion
 - c. Laceration
 - d. Stroke
 - e. Cerebral Hemorrhage
15. Which of the following brain infections can cause death in 24 hours or less?
- a. Meningitis
 - b. Encephalitis
 - c. Parkinson's Disease
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Biology and Behavior

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