Body and Behavior
Chapter 4

Nervous System

- Nerve fibers – nerve cells that carry messages to and from the brain

- Receptors – cells that gather information (senses)

- Effectors – cells that work muscles and internal glands and organs (motor skills)

How the system works

- Neurons – sends messages to and from the brain along the nerve fibers

- Synapses – gaps between nerve cells

- Axons - carry info. to other neurons

- Dendrites - receive info. for other neurons

- Neurotransmitters – connect electrochemical impulses sent by neurons

  Sends info. To next neuron or stops transmission

  Ascending tract – from senses to brain

  Descending tract - from brain to motor skill

Types of neurotransmitters

- Acetylcholine (memory, movement, autonomic nervous system function)
  - Effects Alzheimer’s

- Epinephrine - (arousal, emergency)

- Norepinephrine (memory, learning, arousal)
  - Depression

- Serotonin (sleep, appetite, mood)
  - Depression and OCD

- Endorphins (pain)

- Dopamine (planning, reward, emotions, movement)
  - Schizophrenia (oversupply)
  - Parkinson’s disease (undersupply)
  - Addictions

Central Nervous system

- Brain – interpretation of incoming info.

- Spinal cord – carries information to and from the brain

The Brain

- Hindbrain

- Midbrain

- Forebrain
Hindbrain

- Rear base of the skull
- Cerebellum: base of the spinal cord posture and balance (highly effected by alcohol)
- Medulla: respiration, heart rate, blood pressure (damage = quick death)
- Pons: bridge between spinal cord and brain
  Produces chemicals for sleep, arousal, facial expressions

Midbrain

- located just above the pons
- Lets the forebrain know of incoming info
- Reticular activating system: control of mood, arousal, sleep
- contains serotonin and norepinephrine

Forebrain

- Nucleus Accumbens: reward and pleasure
- drugs, eating, sex, gambling
- Basal Ganglia: voluntary motor movements
- Corpus Callosum: a connection of fibers that links the two cerebral hemispheres.
Forebrain – Cerebral Cortex

- Thought
- Voluntary movement
- Language
- Reasoning
- Perception

Cerebral Cortex

- Somatosensory cortex – receives info.
- Motor cortex – sends info. for body movement

Cerebral Cortex - Lobes

- Parietal Lobe
- Occipital lobe
- Frontal lobe
- Temporal lobe

Parietal Lobe

- Perception of touch, pain, temperature, pressure
- Depth perception

Occipital Lobe

- Vision

Temporal Lobe

- Perception and recognition of auditory stimuli
- Higher visual tasks (facial and object recognition)
- Memory
- Wernicke's area - comprehension of speech
Frontal Lobe
- Reasoning
- Broca's Area - Parts of speech
- Movement
- Emotions
- Problem solving

Hemispheres
- Left hemisphere
  - Verbal
  - Mathematical
  - Analytical
  - Logical
- Right Hemisphere

Corpus Callosum
- 1 million nerve fibers connecting the 2
- Split brain surgery – controls epileptic seizures

Split Brain
- Patient was told to stare at a dot and word nut flashed to right side of the dot (went to left hemisphere)
- Person was able to read and understand
- word nut flashed to left side of the dot (went to right hemisphere/non-verbal)
- Was not able to say, but picked out the nut with the left hand

Peripheral Nervous System
- Somatic nervous system – voluntary activities
  Ex. Stand up
- Autonomic nervous system – involuntary activities
  Ex. Heartbeat, pupils dilate
  *sympathetic nervous system – prepares body for strenuous activity
  Ex. Increased adrenaline
  *parasympathetic nervous system – recovers body from strenuous activity
  Ex. Stress reducers, breathing

Split brain
- Nude woman was flashed to left side of the eye (went to right hemisphere)
- Woman laughed but said nothing and said she saw nothing because only left can speak and left didn't see the nude woman
How to study the brain

• Electrical recordings
• EEG
• Measures brain waves
• Study sleep and brain damage

Polygraph-EEG

EEG will be affected by arousal

Studying the brain

• Lesioning – destroy tissue
• Electrical stimulation – send current to specific brain part
• Brain imaging

Brain imaging

• CT Scan
• X-ray
• Diagnose mental illness
• Abnormalities

Brain imaging

• PET scan
• Radioactive chemicals
• Map out activities
Brain Imaging

- MRI
- 3D image

Damage to Brain

- Concussion
  - Temporary loss of consciousness
  - No permanent damage unless multiple concussions

- Contusion
  - Bruising of neural tissue
  - May cause coma
  - Loss of speech, convulsions, disorientation, delusions

- Laceration
  - Foreign object penetrates brain
  - Effects depend on where in the brain
Shaken Baby Syndrome

The violent movement pitches the infant’s brain back and forth within the skull, rupturing blood vessels and nerves throughout the brain and tearing the brain tissue. The brain strikes the inside of the skull, causing bruising and bleeding to the brain.

Effects of SBS

- Partial or total blindness
- Hearing loss
- Seizures
- Developmental delays
- Speech and learning difficulties
- Problems with memory and attention
- Severe mental retardation
- Paralysis (some particularly traumatic episodes leave children in a coma)

Endocrine System

- **Hormones** – chemical messages sent by the endocrine system

- **Pituitary Gland** – Master gland of the body
- Hypothalamus directs the pit. Gland
- Corrects imbalances
- Regulates metabolism
- **Somatotrophic hormone** – regulates growth
  - Too little – midget (small people)
  - Errors – dwarf (arms/legs short but body normal proportions)
  - Too much – giant
• Thyroid Gland – largest gland/regulates metabolism
  Produces thyroxin
  Too much – hyperactive
  Too little – lazy

• Adrenal Gland – emergency gland
  Adrenal cortex
  3 hormones
  Steroids – strength and endurance
  Aldosterone – water balance
  Cortisone – controls metabolism of carbohydrates, fats and proteins
  Epinephrine (aka adrenaline) emergency hormone
  Regulated by sympathetic N.S
  Noradrenalin – returns body to normal
  Regulated by parasympathetic n.s.

• Pancreas
  Produces insulin and glucogen to control sugar metabolism
  Lack of insulin – diabetic
Sex glands
- Testes – male
  Produce sperm and testosterone
- Ovaries – females
  Produce eggs, estrogen and progesterone
  ** each sex has a small amount of opposite

Nature vs. Nurture
- Do people learn to be smart students or is it hereditary?
- Do people learn to be good athletes or is it hereditary?
- Do people learn to be homosexual or is it hereditary/genetic?

Nature vs. Nurture
- Nature: Inborn – hereditary
  Sir Francis Galton – Hereditary Genius
  Found success ran in families
  David Reimer
- Nurture: Learned – environmental
  John B. Watson – Behaviorist

How to study nature vs. nurture
- Twins
  Identical – develop from a single fertilized egg and share the same genes
  Fraternal – develop from 2 fertilized eggs and are no more similar that brother/sister
  Schizophrenia
    If 1 twin has schizo. The other is 3-6 times more likely if they are identical than if fraternal

Separation at birth
Jim Springer and Jim Lewis reunited 48 yrs. Later
Both 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 vacationed at the same beach at St. Petersburg, Florida. Both had dogs named Toy. Both were police officers. Both did well in math and poor in spelling, bit their fingernails, had identical smoking and drinking habits and liked mechanical drawing.