Your Nervous System

Peripheral Nervous System

Functions of the Nervous System
1. Sensory input – gathering information
   - To monitor changes occurring inside and outside the body (changes = stimuli)
2. Integration –
   - To process and interpret sensory input and decide if action is needed.
3. Motor output
   - A response to integrated stimuli
   - The response activates muscles or glands

Structural Classification of the Nervous System
- Central nervous system (CNS)
  - Brain
  - Spinal cord
- Peripheral nervous system (PNS)
  - Nerve outside the brain and spinal cord
Classification of Nerves

- Mixed nerves – both sensory and motor fibers
- Afferent (sensory) nerves – carry impulses toward the CNS
- Efferent (motor) nerves – carry impulses away from the CNS
Neuron Classification

- **Functional Classification of the Peripheral Nervous System**
  - **Sensory (afferent) division**
    - Nerve fibers that carry information to the central nervous system
  
  ![Sensory Nerve Fibers](slide7.3a)

- **Motor (efferent) division**
  - Nerve fibers that carry impulses away from the central nervous system
  
  ![Motor Nerve Fibers](slide7.3b)
Functional Classification of the Peripheral Nervous System

- Motor (efferent) division
  - Two subdivisions
    - Somatic nervous system = voluntary
    - Autonomic nervous system = involuntary

Organization of the Nervous System

- NERVES that connect the central nervous system to the rest of the body
  1. Motor Division – impulses from CNS to muscles or glands
     - Two Parts:
       - Somatic Nervous System
       - Autonomic Nervous System
  2. Sensory Division – transmits impulses from sense organs to CNS
Motor Division
PNS

Somatic Nervous System
• Controls voluntary movement of the skeletal muscles

Autonomic Nervous System
• Controls involuntary actions
  • Subdivided into two system that have opposite effects on the same organs:
    1. Parasympathetic – decreases heart rate
       ▪ Controls internal organs during normal activity
    2. Sympathetic – increases heart rate
       ▪ Controls internal organs during high stress activity
Types of Reflexes and Regulation

- Autonomic reflexes
  - Smooth muscle regulation
  - Heart and blood pressure regulation
  - Regulation of glands
  - Digestive system regulation
- Somatic reflexes
  - Activation of skeletal muscles

Sensory Division
PNS

Sensory Receptors

- 5 categories
1. Pain Receptors
- Throughout body; except brain
- Respond to chemical released by damaged cells
- Important to recognize
  - Danger
  - Injury
  - Disease

2. Thermoreceptors
- In skin, body core, hypothalamus
- Detect variations in body temperature

3. Mechanoreceptors
- Skin, skeletal muscle, and inner ears
- Sensitive to
  - Touch
  - Pressure
  - Stretching of muscles
  - Sound
  - Motion
4. Chemoreceptors

- Nose and Tongue
  - Chemical in external environment

5. Photoreceptors

- Eyes
  - Sensitive to Light

Hearing and Balance

- Ear
  - Two Functions
    - Hearing
    - Detecting Positional change to movement
Smell and Taste
- Chemoreceptors pick up chemical reception in nose and mouth
- Smell – olfactory bulb
- Taste – taste buds
  - Salty
  - Bitter
  - Sour
  - Sweet
  - Savory*

Touch and Related Senses
- Largest sense organ? Skin
- Sensory Receptors
  - Temperature
  - Touch
  - Pain
- Greatest density of touch receptors
  - Fingers
  - Toes
  - Face

Drugs and the Nervous System
- Drug – any substance, other than food that changes the structure or function of the body
- Legal
- Illegal
Drugs That Affect the Synapse

<table>
<thead>
<tr>
<th>Drug Type</th>
<th>Medical Use</th>
<th>Examples</th>
<th>Effects on the body</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulants</td>
<td>Used to increase alertness, relieve fatigue</td>
<td>Amphetamines</td>
<td>Increase heart and respiratory rates; elevate blood pressure; dilate pupils; decrease appetite</td>
</tr>
<tr>
<td>Depressants</td>
<td>Used to relieve anxiety, irritability, tension</td>
<td>Barbiturates, Tranquilizers</td>
<td>Slow down the actions of the central nervous system; small amounts cause calmness and relaxation; larger amounts cause slurred speech and impaired judgment</td>
</tr>
<tr>
<td>Opiates</td>
<td>Used to relieve pain</td>
<td>Morphine, Codeine</td>
<td>Acts as a depressant; cause drowsiness, hallucinations, nausea</td>
</tr>
</tbody>
</table>

1. Stimulants

- Increase
  - Heart rate
  - Blood pressure
  - Breathing
  - Release of neurotransmitters at some synapses in the brain
- Deplete neurotransmitters and lead to:
  - Fatigue
  - Circulatory problems
  - Hallucinations
  - Depression

2. Depressants

- Decrease
  - Heart rate
  - Breathing rate
  - Blood pressure
  - Relax muscles
  - Relieve tension
- Enhances release of neurotransmitters that prevent nerve cells from firing
- Alcohol with depressants can lead to death – depresses CNS to a point one stops breathing
3. Opiates
- Mimics endorphins
- **Endorphin** – natural chemical in brain that helps overcome pain
- When person stops taking
  - Brain has adjusted to high levels of endorphins
  - Cannot produce enough natural endorphins
  - Suffer uncontrollable pain and sickness

4. Cocaine
- Sudden release of **Dopamine**
- Powerful Stimulant
- Increases heart rate and blood pressure
- First time users can have heart attack
- **Dopamine** – neurotransmitter in brain that is released to give feeling of pleasure and satisfaction

5. Marijuana
- Active ingredient (THC) tetrahydrocannabinol
- More destructive to lungs than cigarettes
  - 5 marijuana cigs = 120 conventional cigs
- Results in:
  - Lower WBC count by 40% - susceptible to infections
  - Teens –
    - Inhibits maturity
    - Retards normal brain growth
    - Memory loss
    - Inability to concentrate
    - Fall short on memory as well as math and verbal skills
  - Males – reduced testosterone levels and increases estrogen levels
  - Females –
    - Irregular menstrual cycle
    - DNA damage to eggs
More Effects (FYI)

- Impaired perception
- Loss of coordination
- Increased risk of accidents
- Impaired judgement
- Loss of motivation
- Diminished inhibitions
- Increased heart rate
- Anxiety, panic attacks, and paranoia
- Hallucinations
- Damage to the respiratory, reproductive, and immune systems
- Increased risk of CANCER
- Psychological dependency

6. Alcohol

- Depressant
- Slows down CNS
- 40% of 50,000 highway deaths are caused by drinking and driving
- 1/3 of homicides attributed to effects of alcohol
- $150 billion dollars of U.S. economy alcohol abuse treatment
- Fetal Alcohol Syndrome (FAS)
  - Drinking while pregnant
  - Heart defects, malformed faces, delayed growth, poor motor development

Alcohol and Disease

- Long-term alcohol use or bouts of excessive consumption
- Destroys liver cells
- Cirrhosis of liver – formation of scar tissue that prevents blood flow through liver
Only Way to Prevent Addiction and Effects of Drugs

- NOT taking them to begin with