Objectives

To introduce the autonomic nervous system.
To address the neuronal pathways that influence the ANS.
To compare and contrast the:
Parasympathetic nervous system
with
Sympathetic nervous system

Autonomic Nervous System

PNS component that is involuntary.
Motor neurons innervate the visceral functions.
Examples of systems regulated:
- Heart rate
- Motility of GI tract
- Secretion of glands of endocrine system

The Autonomic Nervous System (ANS)

Anatomical features of ANS

I. Sensory neurons originate at site of visceral interceotors:
   - temp, blood gases, body fluids → osmolarity
   - Cell body is in posterior/dorsal root ganglion
   - Synapses with interneurons in (posterior gray horn).

II. Motor/efferent pathway (2 neurons)
   1. Preganglionic (CB in CNS) –Light myelin
   2. Postganglionic (CB outside CNS) – w/o M
      postganglionic axon that extends to the effector organ

Specifics of the Parasympathetic

Preganglionic originate in:
> brain stem – Cranial nerves III, VII, IX & X (vagus)*
> spinal cord S2–S4 segments
Collectively referred to as craniosacral
> Leave via anterior root of the spinal nerve.
> Long preganglionic & short postganglionic

* 90% of all preganglionic parasymp fibers in the body exist in association with the vagus nerve.
Role of the Parasympathetic

- Promotes maintenance activities and conserves body energy
- Its activity is illustrated in a person who relaxes, reading, after a meal
  - Blood pressure, heart rate, and respiratory rates are low
  - Gastrointestinal tract activity is high
  - Pupils are constricted and lenses are accommodated for close vision

Specifics of the Sympathetic

- Highly interconnected system - body wide response system aka "Fight or Flight"
- Preganglionic originate in:
  - Spinal cord: T1-L2
  - Collectively referred to as thoracolumbar
  - Short preganglionic & long postganglionic
  - Neurons leave the spinal cord via Anterior rami
  - Rami communicans
  - Sympathetic trunk ganglion

Effects of the Sympathetic

- Metabolic:
  - Increases the met rate of body activity
  - Raises blood glucose levels
  - Mobilizes fats for use as fuels
  - Increases mental alertness
  - Also stimulates the kidneys to release renin to increase B.P.

Activating the Sympathetic N.S.

Autonomic Nervous System Divisions

- **Sympathetic**
  - Increases heart rate
  - Vasodilation
  - Dilates pupils
  - Liver releases glucose
  - Alertness higher
  - Increased breath rate
  - Decreased urine output
  - Pupil erection

- **Parasympathetic**
  - Decreased heart rate
  - Vasoconstriction
  - Normal iris constriction
  - No effect on liver
  - Increased peristalsis
  - Regular breathing rate
  - Sphincters relaxed
  - Penile erection possible
## ANS Anatomy

<table>
<thead>
<tr>
<th>Division</th>
<th>Origin of Fibers</th>
<th>Length of Fibers</th>
<th>Location of Ganglia</th>
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<tbody>
<tr>
<td>Sympathetic</td>
<td>Thoracolumbar region of the spinal cord</td>
<td>Short preganglionic and long postganglionic</td>
<td>Close to spinal cord</td>
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<tr>
<td>Parasympathetic</td>
<td>Brain and sacral spinal cord (craniosacral)</td>
<td>Long preganglionic and short postganglionic</td>
<td>In visceral effector organs</td>
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