API Notes Home Page

# Autonomic Nervous System

## (parasympathetic & sympathetic)

**if you could control this system think in terms of:**

**Fight or flight: what do you do when there is a tiger in the room**

**Maintenance: what do you do when you are "vegging out" on the Lazy Boy.**

## I). Summary

- Involuntary nervous system or visceral motor nervous system.
- Functions in coordination with the somatic and sensory system and higher brain functions.
- Both systems are fully integrated.

Dual system with the **parasympathetic** and **sympathetic** system innervating the same organs but **causing opposite effects**.

- **Sympathetic: Fight or Flight (tiger in the room)**
- **Parasympathetic: Maintenance ("vegging out" on the Lazy Boy)**

## II). Comparison to Somatic Nervous System

### A). Effectors

**Somatic:**

- Skeletal muscle (only)

**Autonomic:**

- Smooth muscle
- Cardiac muscle
- Glands

### B). Efferent Pathways

**Somatic:** cell body in CNS axon attaches to skeletal muscle.

- Conduction of impulses very fast

**Autonomic**: 2 neuron chain

- Cell body of first neuron in the CNS
- 2nd neuron outside CNS and attached to effector organ.
- Conduction of impulses slower.

C). **Neurotransmitter Effects**

**Somatic:** Always excitatory

**Autonomic:** Excitation or Inhibition

III). **Differences in Parasympathetic & Sympathetic Divisions**

A). **Functional Role**

**Parasympathetic**: Maintenance functions

- Conserves & stores energy

**Sympathetic:** Prepares the body for emergencies

- Intense muscular activity
- **Fight or Flight**

B). **Origin sites**

**Parasympathetic:** Brain & Sacral Spinal Cord

**Sympathetic:** Thoracic-Lumbar Spinal Cord

C). **Length of ganglionic fibers**

D). **Neurotransmitters**

**Parasympathetic:** Acetylcholine

**Sympathetic:** Some Acetylcholine in preganglia (first neuron that connects to the second neuron) but postganglia release **Norepinephrine (**common term Adrenaline) this goes to the effectors.

IV). **Parasympathetic Division (Maintenance division)**

**(When you are "vegging out" on the lazy boy you do not want your heart racing. This is a time to digest your hamburger and lounge around)**

A). Parasympathetic fibers do not run in spinal nerves. (Vagus nerve is a cranial nerve, so are many of the parasympathetic nerves)

B). Nerves arise from the cranial, (brainstem) and the sacral region.

C). **Nerves involved**

1). **Oculomotor Nerves:** constrict pupils focus on objects

2). **Facial Nerves**: activates glands

lacrimal glands & salivary glands

(Think of the oppisite when you are exicited your mouth dries up because the last thing you need is to process food)

3). **Glossopharyngeal Nerves**: salivary glands

4). **Vagus Nerves:**

Serves most of the visceral organs

- Cardiac plexus: **Slows the heart rate**
- Pulmonary plexus
- Esophageal plexus: liver, gallbladder, stomach, small intestine, kidneys, pancreas, large intestine. (This is independent of the spinal cord)

5). **Sacral Nerves**: pelvic organs, bladder, genitals & large intestine.

V). **Sympathetic Division (fight or flight)**

Innervates visceral organs, **adrenal glands,** sweat glands and hair raising glands and vascular smooth muscle.

When the tiger is in the room you do not want blood and energy going tot he visceral organs to digest your dinner you want blood going to the muscles (vascular dilation) and when you are running you are producing heat so you need to sweat)

## Functions of Sympathetic and Parasympathetic Divisions

**Look at this table and think of how to balance resources when there is a tiger in the room.**

| Organ/Gland | Parasympathetic | Sympathetic |
|---|---|---|
| | **Relaxing in the lazy boy** | **There is a tiger in the room** |
| **Cellular metabolism** | ---------- | Increases |
| **Sweat gland,**<br>**Adrenal Glands,**<br>**Hair raising muscle** | ---------- | Stimulates |
| **Digestion** | Stimulates | Inhibits |
| **Heart muscle**<br>**Heart rate** | Decreases | Increases |
| **Coronary**<br>**Blood vessels** | Constricts | Dilates |
| **Blood Vessels** | ---------- | Constricts visceral<br>Dilates skeletal muscle |
| **Mental alertness** | ---------- | Increases |
| **Bladder** | Promotes voiding | Inhibits voiding |