



**King Saud University
College of medicine
Foundation block**

Autonomic Nervous System



Objectives

Define the autonomic nervous system.

Describe the structure of autonomic nervous system

Trace the preganglionic & postganglionic neurons in both sympathetic & parasympathetic nervous system.

Enumerate in brief the main effects of sympathetic & parasympathetic system

COLOR INDEX

IMPORTANT POINTS

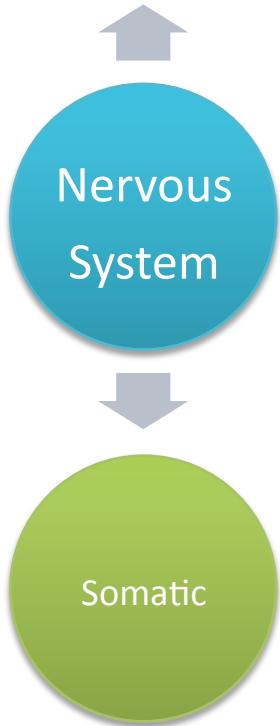
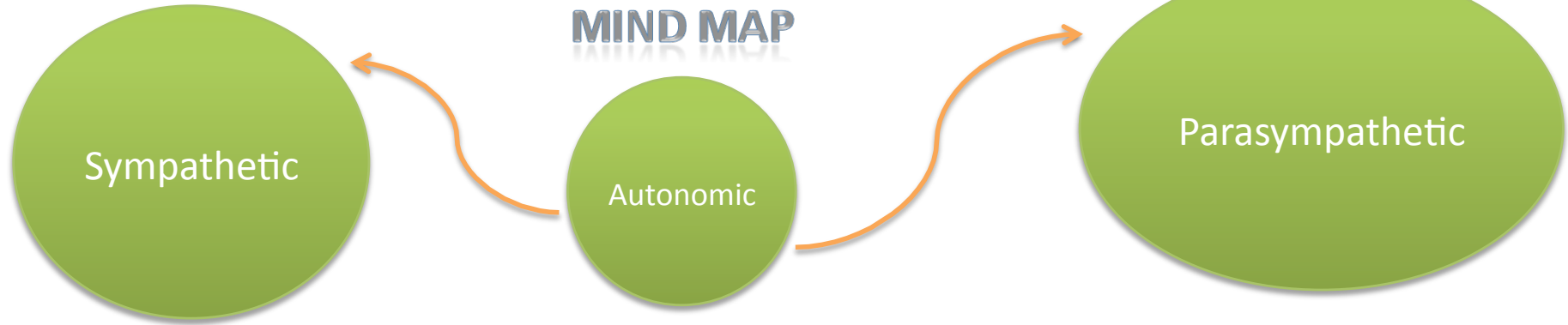
HEAD LINES

SUBTITLES

EXTRA EXPLANATIONS

GIRLS NOTES
BOYS NOTES

MIND MAP



Viscera : abdomen/
pelvis area

Conjunction :
together

Antagonistic :
Against each other
(عكس بعض)

Parasympathetic & Sympathetic are DIFFERENT anatomically & chemically, and they have different functions. BUT both operate in conjunction with one another (have antagonistic control over the viscera) to maintain a stable internal environment

Autonomic Nervous System

Main function is to keep the body homeostasis

With the help of the endocrine system

Is controlled by the hypothalamus

not under our control
(involuntary muscles)

Cardiac

smooth

Visceral organs

glands

Comparison between Somatic & Autonomic

<u>Somatic</u>	<u>Autonomic</u>
Effectors: Skeletal muscles	Effectors: Smooth & cardiac muscles & glands.
Has one motor neuron	Has two motor neurons
Synapses directly to the effector	Not directly to the effector (passes the ganglia)
voluntary	Non voluntary

The Autonomic function

Its function is homeostasis of the internal environment

Located both in the central and peripheral nervous system

the pathway of the autonomic nervous system is made up of two neurons called as **preganglionic** and **postganglionic** neurons

*Myelinated (White rami)

*Located between the cell body and the ganglia

*Nonyelinated (grey rami)

*Extends from the ganglia to the target organ

Comparison between parasympathetic and sympathetic nervous systems:-

Parasympathetic	Sympathetic
Ganglia lies nearer to the target	Ganglia lies nearer to CNS
Preganglionic fiber is long	Preganglionic fiber is short
Preganglionic are on pairs (connected by sympathetic chains)	Large and many
Preganglionic is partly on the brain Partly on the spinal cord	On the spinal cord from T1 to L2 <u>BUT</u> not present on the brain

The **parasympathetic** is work when your body is at rest **While** the **sympathetic** is Activated when you under stress.
(they work in the same time but they have opposite activity)

Sympathetic Ganglia

- Preganglionic ganglia is located in lateral grey horn of T1 to L2
- The autonomic ganglia is located nearer the central nervous system as:
 - **Prevertebral:** celiac & mesenteric (In front of the spine)
 - **Paravertebral** forming sympathetic chains

- Three in cervical part of chain
- Eleven to twelve in thoracic part
- Four in lumbar
- Four in sacral
- One common (fused) near coccyx (ganglion impar)

Paravertebral
ganglions





Sympathetic Fibers

Preganglionic

- Travel through spinal nerve
- Join the sympathetic chains **via**. White rami communions (WRC)

The fiber may:

- ❖ Ascend, descend or remain  synapses with postganglionic neuron of paravertebral ganglia
- ❖ Leave  without synapping, to reach -coeliac
-mesenteric ganglia

*then synapses with their postganglionic neuron

Sympathetic Fibers

Postganglionic

- Leave the sympathetic chain back to spinal nerve via grey rami (GRC)
to supply head, thorax, blood vessels, sweat glands
- Leave the cell of coeliac and mesenteric ganglia
to supply abdominal and pelvic viscera

Parasympathetic Ganglia

- Preganglionic neuron located in:
Nuclei of 3rd, 7th, 9th, and 10th
Lateral grey horn of spinal cord s2, s3, to s4
- Autonomic ganglia lies near or within the wall of the target organ


Parasympathetic Fibers

cranial outflow

- Preganglionic fibers from *cranial outflow* are carried by **3rd, 7th, 9th & 10th** cranial nerves and terminate in **ciliary(3rd)**, **pterygopalatine(7th)**, **submandibular(9th)**, **otic (10th)** & **peripheral ganglia**.
-
- Postganglionic fibers innervate organs of the head, neck, thorax, and abdomen

sacral outflow

- Preganglionic fibers from *sacral outflow* are carried by **pelvic splanchnic nerves** to peripheral ganglia in pelvis where they synapse.
- Postganglionic fibers innervate organs of the pelvis and lower abdomen



Check your
knowledge

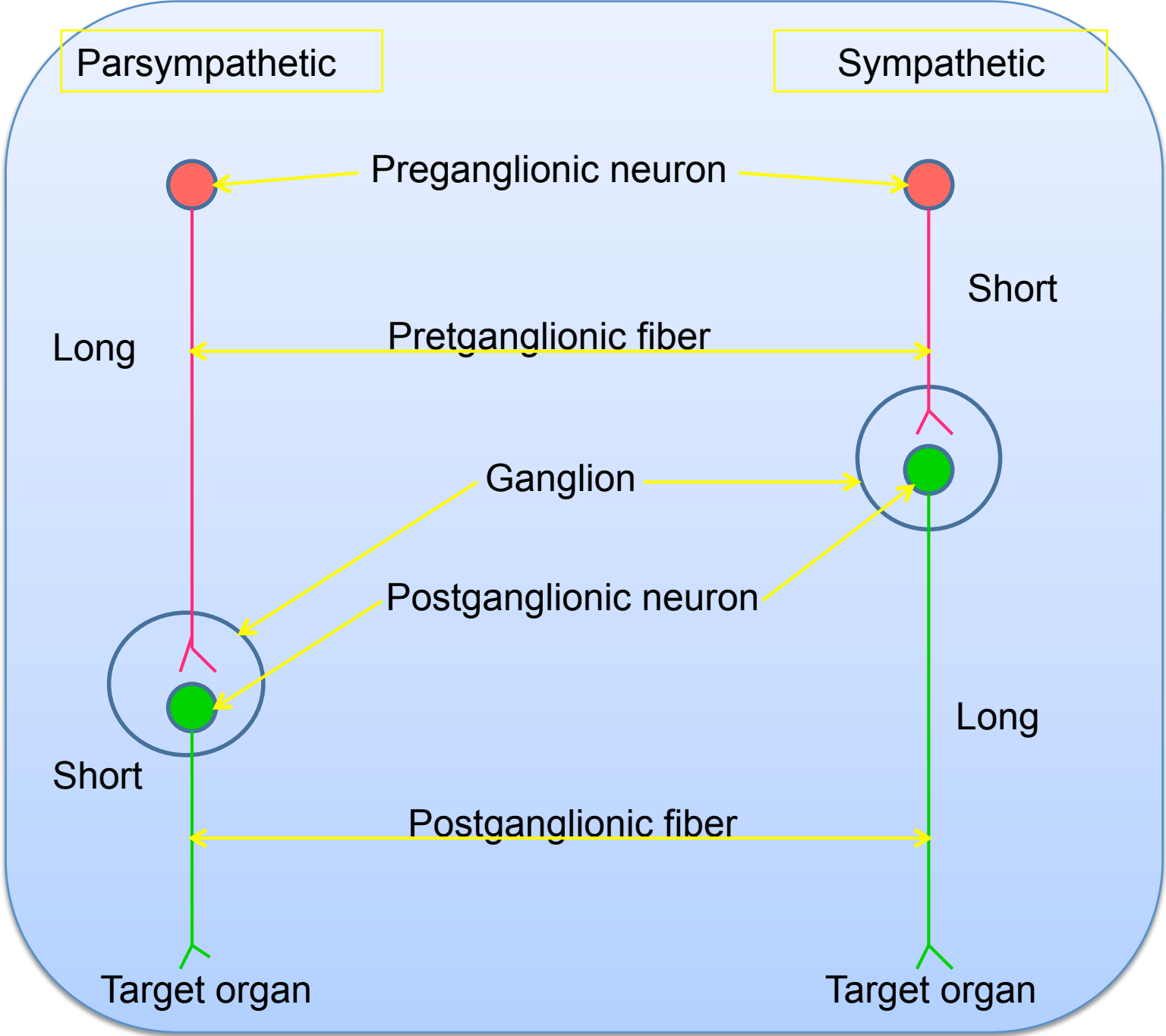
Gray rami is the fiber of postganglionic (true)

White rami is the fiber of preganglionic (true)

Preganglionic fiber is myelinated (true)

Parasympathetic is located on the brain (true)

Parasympathetic is located on the brain only (false)



Enjoy watching the video below! It will help you out!



MCQ

1) What is the autonomic nervous system?

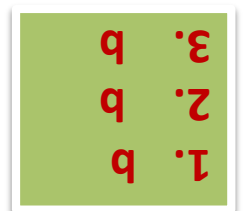
- a. Part of the central nervous system independent of the will.
- b. The efferent pathway to the viscera (all fibres connecting the CNS to glands, smooth muscles and heart).
- d. All efferent fibres in the body except those to smooth muscle.
- e. Afferent (sensory) fibres from the bone.

2) The two major division of the autonomic system are the sympathetic and parasympathetic. Where do parasympathetic fibres originate?

- a. The thoraco-lumbar spinal region.
- b. The cranial and sacral regions.

3) Adult spinal cord often terminates inferiorly at the vertebral level of:

- a. T 12.
- b. L 1-2.
- c. L 2-3.
- d. L3-4.
- e. S1-S2



4) Effector organs of the ANS include all of the following EXCEPT:

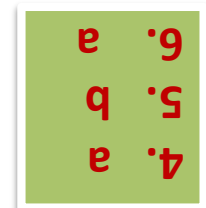
- a. Medulla oblongata.
- b. Arteriolar smooth muscle.
- c. Heart.
- d. Visceral smooth muscles.
- e. Glands.

5) The system that controls smooth muscle, cardiac muscle, and gland activity is the:

- a. Somatic nervous system.
- b. Autonomic nervous system.
- c. Skeletal division.
- d. Sensory nervous system.

6) The peripheral nervous system includes the:

- a. Somatic nervous system.
- b. Brain.
- c. Spinal cord.
- d. Nuclei.



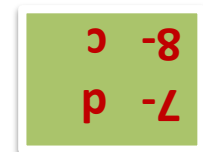
7) The somatic nervous system is part of the:

- a. Sympathetic nervous system.
- b. Parasympathetic nervous system.
- c. Autonomic nervous system.
- d. None of the above.

8) The autonomic ganglia:

- a. Are 5 types.
- b. Are the sites of relay of afferent neurons.
- c. Function as distributing centres.
- d. Are located inside the CNS.
- e. Are relay stations for all pregang . fibers passing through them .

 well done



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Done by :-

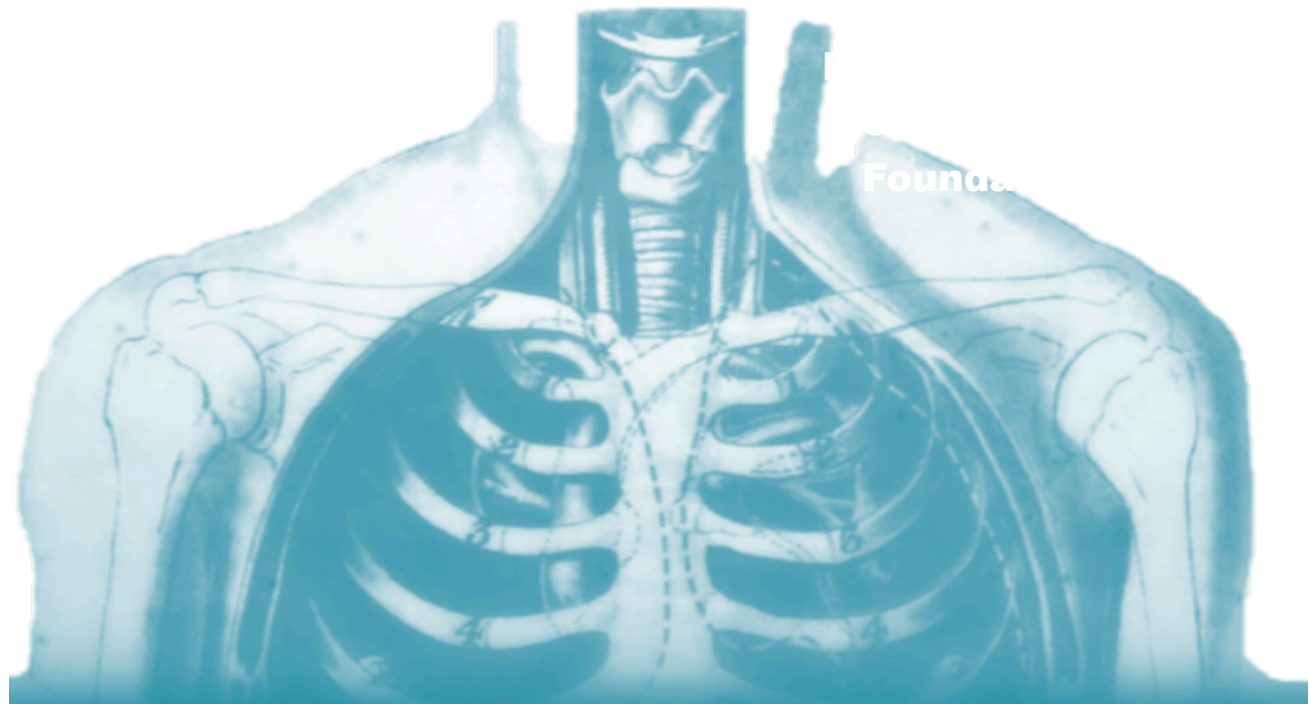
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Good luck



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