Asia-Pacific Chiropractic Journal

eBOOKCHAPTER

Introduction to Chiropractic Manipulative Reflex Technique (CMRT)

(Chapter 3)

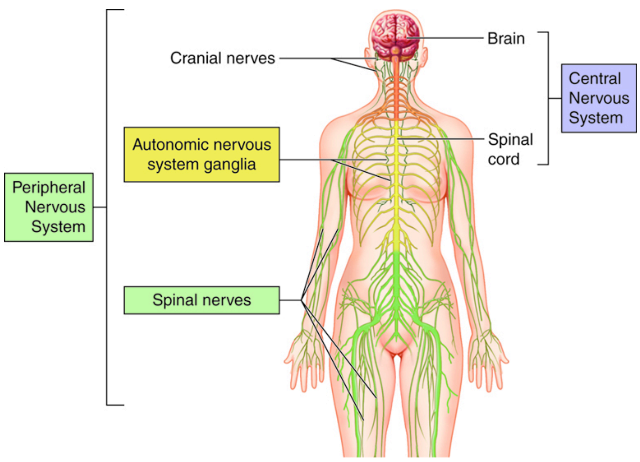
Charles L Blum

Chapter 3

The Relationship Between the Somatic and Autonomic Nervous Systems

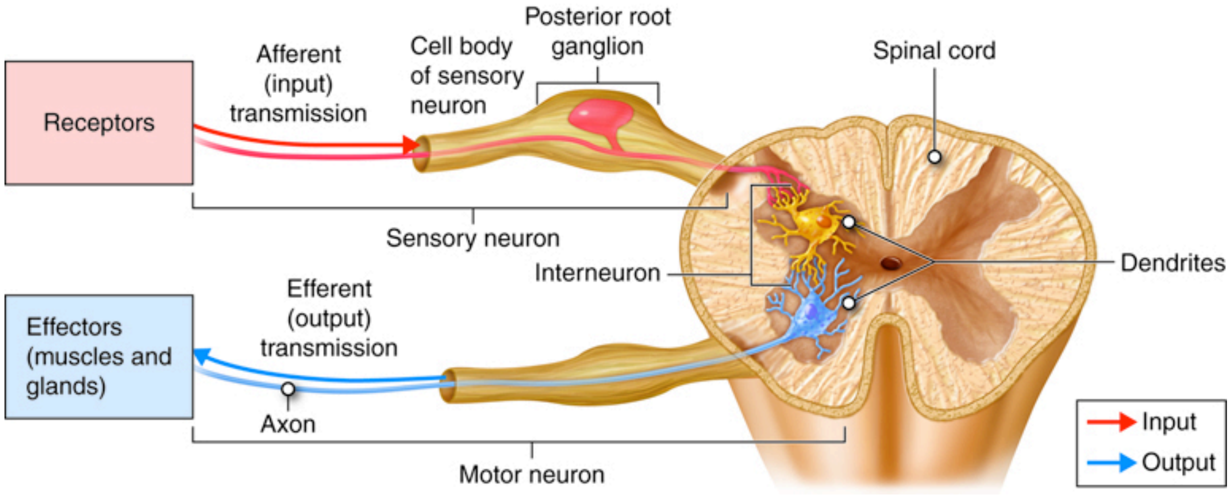
To better understand some of what we are attempting to affect with Chiropractic Manipulative Reflex Technique (CMRT), it is helpful to have a brief overview of the autonomic nervous system.

The autonomic nervous system is considered to be a component of the peripheral nervous system that regulates involuntary physiologic processes such as heart rate, blood pressure, respiration, digestion, and endocrine organ function. It contains three anatomically distinct divisions: sympathetic, parasympathetic, andenteric, though there is some thought that the enteric nervous system may represent its own distinct system.



This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States. 39. Nervous System Levels of Organization. [https://pressbooks.ccconline.org/bio106/chapter/nervous-system-levels-of-organization/]

The sympathetic nervous system is connected to the thoracolumbar part of the spinal cord and the parasympathetic system is connected to certain cranial (III,VII, IX, and X) and sacral/nervi erigentes (S2-4) nerves. In most of the viscera, both parts of the autonomic system give branches of supply and their effects, in such cases, are antagonistic.



Neurons can be classified according to their function. This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States. [https://pressbooks.ccconline.org/bio106/chapter/nervous-system-levels-of-organization/]

In both systems the motor cells are outside the central nervous system. They are in ganglia associated with the sympathetic trunks in the sympathetic system, while in the parasympathetic system the motor cell-body is usually more peripheral and located near or in the wall of the organ itself. In both systems the fiber of the connector cell passes from the central nervous system to a motor cell body in a ganglion; this is the preganglionic fiber and it is a medullated or white fiber. The fiber of the motor cell leaves the ganglion (postganglionic fiber) as a non-medullated or grey fiber.

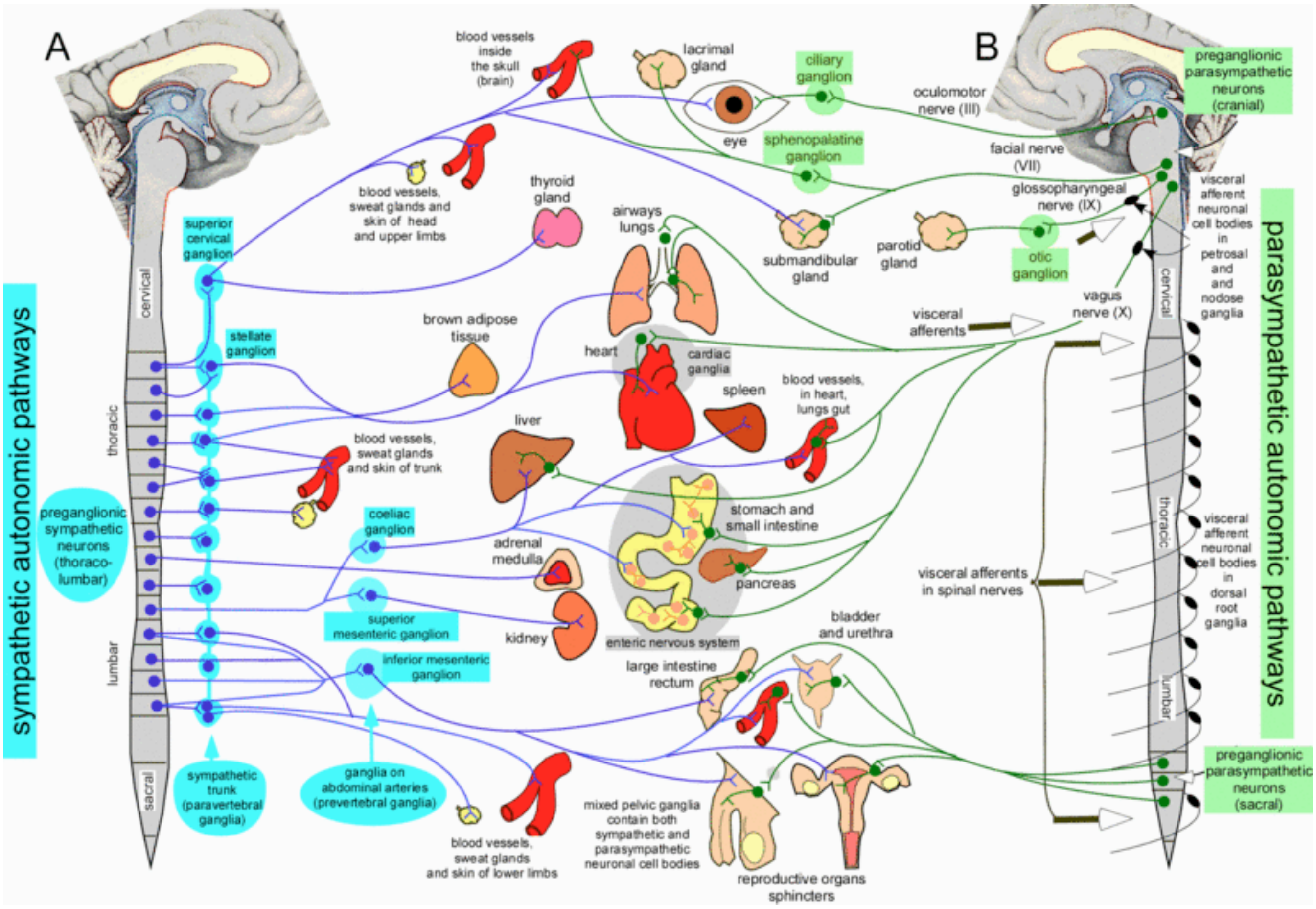
The efferent (motor) side of both sympathetic and parasympathetic systems consists of preganglionic (white) fibers of connector cells. The cell bodies of sympathetic preganglionic neurons are located in the visceral efferent (lateral gray) column of the spinal cord. The cell bodies of parasympathetic preganglionic neurons are located in the motor nuclei of the cranial nerves. (see image next page)

There are three basic groups of ganglia in the autonomic system.

The first group is called the sympathetic trunk and is a series of ganglia that lie in a horizontal row on either side of the vertebral column close to the bodies of the vertebrae. These ganglia are connected to each other by short fibers and look like beads on a chain, with one chain on each side of the spinal column. The sympathetic trunk usually extends downward through the neck, thorax, and abdomen to the coccyx. Generally, there are 22 ganglia in each chain: three cervical, eleven thoracic, four lumbar and four sacral. While the sympathetic ganglia extends the length of the vertebral column they receive preganglionic fibers only from the thoracic and lumbar regions of the spinal cord.

The preganglionic fibers of the sympathetic trunk leave the spinal cord as part of the spinal nerve. Then they branch away from the somatic fibers of the nerve and enter the nearest sympathetic trunk ganglia. The (white) preganglionic axon connects to the spinal cord with the ganglia of the sympathetic trunk. Some synapse in the first ganglia as they enter and others pass through the ganglion to run upwards or downwards and synapse in ganglia above and below. This is how branching and divergent fibers reach the cranium and sacral regions. Some postganglionic fibers leaving the sympathetic trunk ganglia pass directly to the viscera of the head, neck, chest and abdomen.

Those fibers that do not go to the viscera will rejoin the spinal nerves and pass to peripheral visceral organs such as sweat glands and the smooth muscles in the blood vessels. The portions of the axons of the postganglionic neurons that run from the ganglia of the sympathetic trunk to the spinal nerves are the grey.



ANS Pathways. This work by Cenveo is licensed under a Creative Commons Attribution 3.0 United States.
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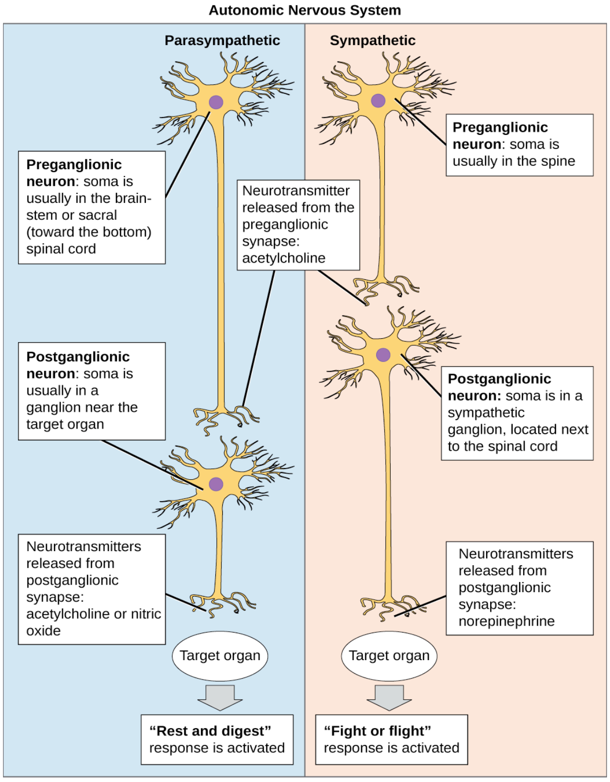
The second type of ganglia is the prevertebral ganglion. They lie anterior to the spinal column and close to the large abdominal arteries from which their names are derived. The celiac ganglion is located below the diaphragm, the superior mesenteric ganglion is in the upper abdomen and the inferior mesenteric ganglion is located in the middle of the abdomen. Like the sympathetic ganglion the prevertebral ganglia receive their preganglionic (white) fibers from the thoracic and lumbar regions of the spinal cord. The preganglionic fibers leave the spinal cord along with a spinal nerve, branch into the sympathetic trunk (after branching into a white ramus) and leave the trunk to enter a prevertebral ganglion. Only in the prevertebral ganglion do they synapse with a postganglionic cell. From there the postganglionic fibers leave the prevertebral ganglia following the course of various arteries to the viscera in the abdomen and pelvis.

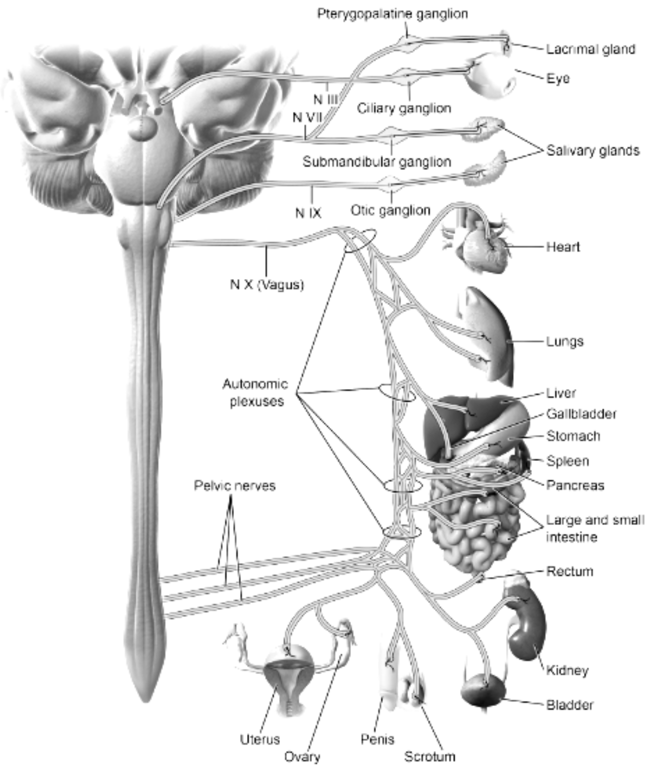
The third kind of autonomic ganglion is called a terminal ganglion and is located at the end of the visceral efferent pathway. Terminal ganglions can be located close to the viscera or even in the walls of the viscera themselves. Terminal ganglia receive preganglionic (white) fibers from the cranial and sacral region of the spinal cord and do not pass through the sympathetic ganglia. These are the pathways of the parasympathetic nerve fibers.

In general the sympathetic nervous system tends to have a widespread (divergent) effect on the viscera since a nerve impulse in a single preganglionic neuron may spread up and down the sympathetic ganglion before traveling to various organs. On the other hand the parasympathetic nerve tends to directly reach the viscera in question (convergent) and its action tends to be more specific.

Of importance, Kiana, et al. note that "chiropractic care and spinal manipulation regulate the autonomic nervous system at peripheral level and its projections to the central nervous system. In particular, they may activate the parasympathetic system to counterbalance the activity of the sympathetic system." Kiana. et al., also recommend application of vagus stimulation techniques such as the ones shared in this text.



Parasympathetic Nervous System Innervations



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