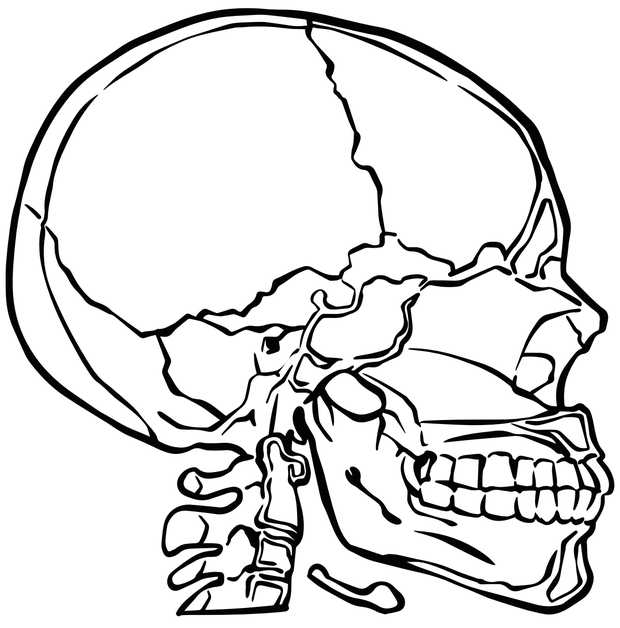
Nervous System

The central nervous system is made up of the brain and the spinal column. These are at the dorsal/posterior of the body.

- The most important part of the nervous system is the brain. The brain coordinates everything with the body. Without the brain there is no movement, no thinking, no emotions, no anything. It is split into several sections that have designated functions.

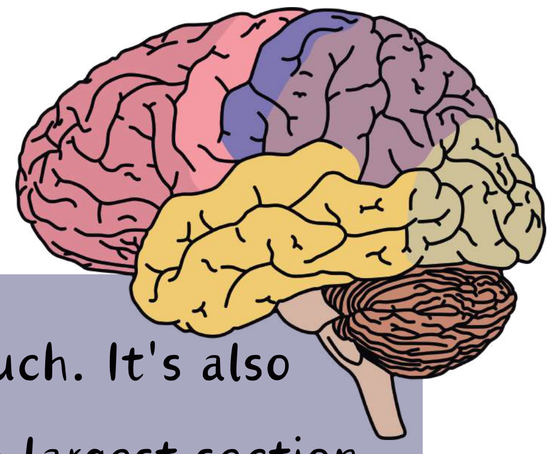
- The skull is made of flat bone that fits together and forms a protective sphere around the brain. There are also several layers of membranes that cover the brain and the spinal column. These are called the meninges. The last part of protection is cerebrospinal fluid (interstitial fluid). The fluid surrounds the brain and protects it from being jolted and jostled from side to side.

Interstitial fluid is made mostly of water, but it also has lots of solutes in it.



Nervous System

Must-Know Brain Anatomy



- The cerebrum processes sensory information such as sight, sound, and touch. It's also responsible for experiencing emotions and facilitating learning. This is the largest section of the brain.
- The cerebellum is located on the back/lower part of your brain, and it is in charge of balance, fine motor skills, memory of skills, and coordination. For example, playing the piano can help develop the cerebellum because it involves using fine motor movements.
- The brain stem regulates the body and is in charge of involuntary muscle contractions such as breathing, heart beating, and smooth muscle contractions in the digestive system. It also plays a role in the sleep cycle.
- The frontal lobe is part of the cerebrum. It is at the very front of the brain, behind the forehead. This part of the brain plays a large role in personality, social skills, intellect, memory, decision-making, and speech.
- The occipital lobe is at the back of the brain and its function is to interpret color, shapes, and any visual stimuli detected by the eyes. It is also how you interpret movement.
- Temporal lobes are next to the ears on either side of the parietal lobes. These are essential to memory. These are the lobes that help you recognize faces and names, remember what words to say, and connect the dots with emotions from other people.
- The parietal lobes are in the center of the brain. They are in between the frontal and occipital lobes. This part of the brain interprets what the other lobes sense. In other words, it merges all the senses that the other lobes have. So while your cerebellum is coordinating your movements, the parietal lobe is merging that with the sights and visual movement that is being reported by the occipital lobe.
- Insular lobes are around the temporal lobes. These process sensory and pain perception. They are similar to the parietal lobes, but small scale.

Nervous System

- Gray matter is on the surface of the brain and is made up of cell bodies. Gray matter makes up the cells that help with senses, memory, emotions, and anything that needs processing.
- White matter is found deeper in the brain and is responsible for conducting nerve signals. This tissue acts as a communication pathway. It is made up of a collection of nerve fibers (axons) that have a fatty substance called myelin (which gives it its white appearance) and surrounds the axons.

Myelinated tissue is fatty and wraps around the axon. It allows the signal to travel 100 times faster.

- The hypothalamus is the link between the nervous system and the endocrine system. This manages the endocrine system along with the pituitary gland, but it also manages the body temp, hunger and thirst, sexual drive, and sleep.

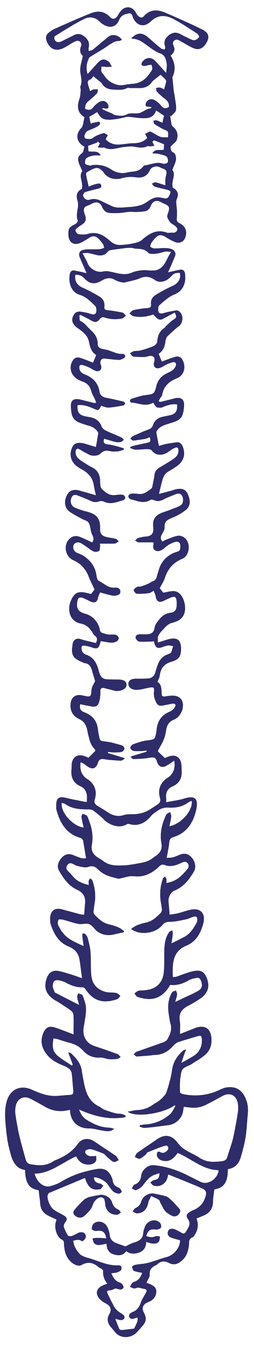
You Got This!

- The brain stem is the part that is connected to the spinal column.
- The midbrain is the top of the brain stem and is connected to the brain. It helps control precise eye movements and is also involved in processing vision and hearing information.
- The pons is the middle part of the brain stem. It manages facial movements and helps with hearing and fine motor movements of the eyes.
- Damage to the pons can result in not being able to use face muscles.
- The medulla oblongata is connected to the spinal column and regulates circulatory functions, swallowing, chewing, head rotating, and breathing.

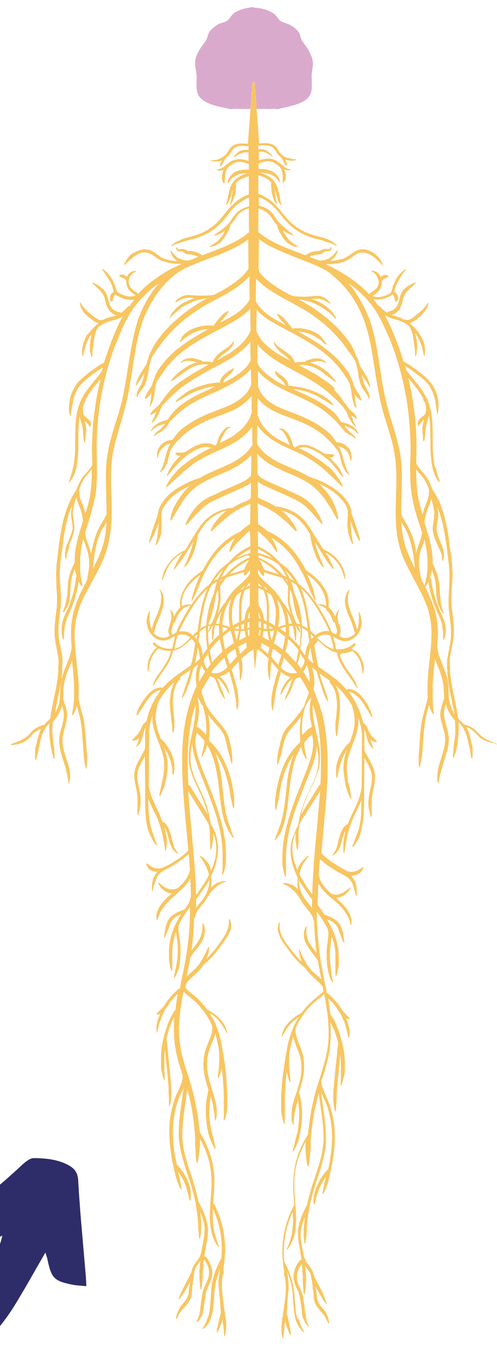
A mix of voluntary and involuntary movements

Nervous System

- The spinal column is divided into sections. Each section is different because of their various functions and different levels of flexibility and support.
- The top section of the spine is made up of seven cervical vertebrae. The top two vertebrae are called C1 and C2, and they allow the head to rotate and turn.



- The second spine section is the thoracic section. This is over the thoracic cavity. There are 12 vertebrae called T1 through T12. The thoracic vertebrae are thinner and wider, making a wider spinal column, and leaving less room for the spinal cord.
- The lumbar spine is over the abdominal cavity that harbors the organs of the abdomen. The five vertebrae in this section are very large and are able to carry weight.
- The sacrum is made up of five vertebrae that fuse together into a single bone in adulthood. This bone connects to the hip bones.
- The last part of the vertebrae is called the coccyx. It is made up of four vertebrae that are fused together. These are very small and make up the tailbone.



There is a canal in the vertebrae that holds the motor nerves, sensory nerves, autonomic nerves, and spinothalamic tract. These nerves then get smaller and disperse throughout the body.

Nervous System

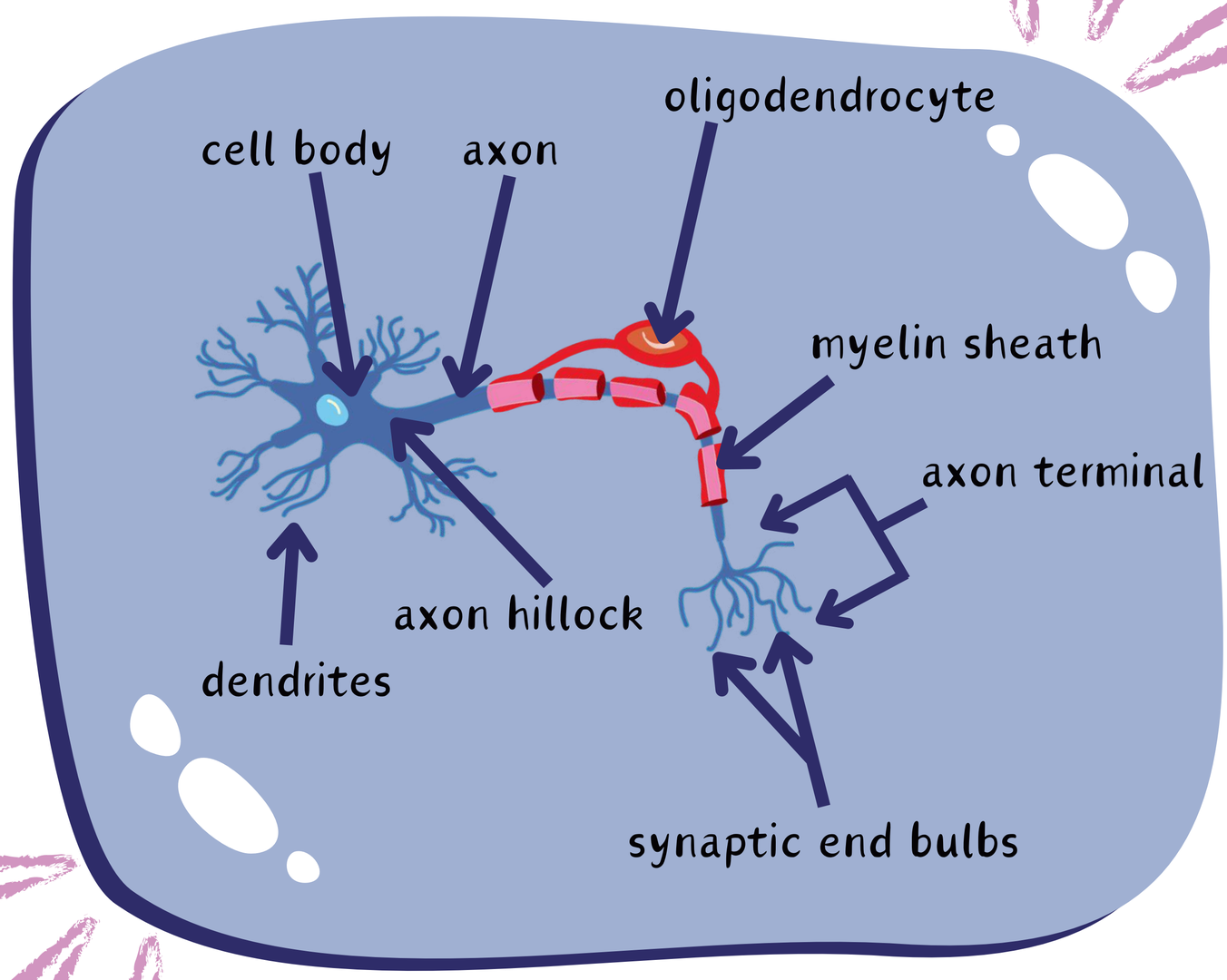
- The parasympathetic nervous system is the part of the system that helps your body "rest and digest." It is in charge of slowing the body down and helping it relax. It is also in charge of the enteric nervous system.
- The enteric nervous system controls the process of digestion by controlling the muscle contractions and churning of the stomach. It's also in charge of the secretion of juices and enzymes, and maintains the pace of digestive tract.
- The parasympathetic nervous system also relieves the body of stress. It actively relaxes you. If the system is working well and it is used a lot, it can lower the risk of heart attacks, headaches, and other inconvenient things. The PNS is only in the head, viscera, breasts, and testes.
- The sympathetic nervous system is in charge of the fight-or-flight response in the body. This is triggered by fear or very stressful situations. It increases heart rate, increases vasodilation, increases blood pressure (this provides more oxygen to the muscles), relaxes lungs so that there can be larger breaths, increases dilation of the eyes, and slows the enteric system so that you don't feel hungry and don't feel the need to urinate. These nerves are mainly in the spinal cord, ganglia, and a few other areas.

The coolest thing about this part of the nervous system is that it is independent from the brain. The brain does not tell it what to do. The system just works by itself.

Nervous System

The nervous system works by sending electrical pulses (messages) down nerves. Nerves are made up of neurons, which can transfer signals throughout the entire body.

- Here are the parts of a neuron:
  - Dendrites are branch-like extensions of a neuron that project from the cell body and receive signals from other neurons. Dendrites transmit electrical signals and also use neurotransmitters that diffuse across the synapse.
  - The axon is a long extension that transfers the signal to the next neuron. It can do this through electrical pulse or diffusing neurotransmitters such as acetylcholine.



  - Axons can be myelinated. Myelination is when there is a fatty sheath that is wrapped around the entire axon. This insulates the axon and allows the signal to travel 100x the speed as an unmyelinated axon. This is because it gives them better conduction.
  - Oligodendrocytes produce the needed myelination in the CNS, and Schwann cells do it in the peripheral nervous system.
  - If there are breaches in myelination, it might cause damage to nerves and less development in a young child.
  - The axon hillock controls when the neuron passes on the signal.
  - The axon terminal actually allows the neurotransmitters to diffuse.