



Nervous System

Adverbs (Formation and Position)

Part1

Focus on the Central nervous system (CNS)

- Vocabulary
- Translation
- Definition

Focus on the central nervous system (CNS)

1. Vocabulary and Translation

1. The brain= le cerveau
2. The grey white matter = substance grise / blanche
3. The cranial nerves = les nerfs crâniens
4. The spinal nerves = les nerfs rachidiens
5. The cerebellum =le cervelet
6. The brain stem = le tronc cérébral
7. The medulla oblongata = le bulbe rachidien
8. The mesencephalon/ the midbrain = le mésencéphale
9. The basal ganglia = les ganglions de la base
- 10.The dura mater = la dure-mère
- 11.The thalamus = le thalamus
- 12.The hypothalamus = l'hypothalamus
- 13.The pons = le pont de Varole
- 14.The pituitary gland/ the hypophysis = l'hypophyse
- 15.Cerebrospinal fluid (CSF) = liquide céphalorachidien (LCR)
- 16.The spine = le rachis
- 17.The spinal cord = la moelle épinière
- 18.The peripheral nervous system (PNS) = le system nerveux périphérique
- 19.Nerve impulse = influx nerveux
- 20.Motor function = motricité
- 21.Vasovagal syncope = malaise vasovagal

2- Definition

I. The brain



Figure 1

1. What is the brain?

The brain is a complex organ that controls thought, memory, emotion, touch, motor skills, vision, breathing, temperature, hunger and every process that regulates our body. Together, the brain and spinal cord that extends from it make up the central nervous system, or CNS.

2. What is the brain made of?

Weighing about 3 pounds in the average adult, the brain is about 60% fats. The remaining 40% is a combination of water, protein, carbohydrates and salts. The brain itself is not a muscle. It contains blood vessels and nerves, including neurons and glial cells.

II. The grey/ white matter

What is the gray matter and white matter?

Gray and white matters are two different regions of the central nervous system. In the brain, gray matter refers to the darker, outer portion, while white matter describes the lighter, inner section underneath. In the spinal cord, this order is reversed: The white matter is on the outside, and the gray matter sits within.

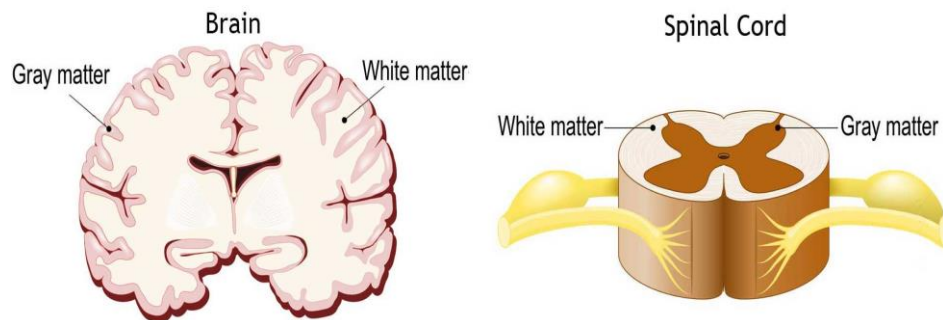


Figure 2

The grey and white matter

III. The cranial nerves

Inside the cranium (the dome of the skull), there are 12 nerves, called cranial nerves:

- Cranial nerve 1: The first is **the olfactory nerve**, which allows for your sense of smell.
- Cranial nerve 2: **The optic nerve** governs eyesight.
- Cranial nerve 3: **The oculomotor nerve** controls pupil response and other motions of the eye, and branches out from the area in the brainstem where the midbrain meets the pons.
- Cranial nerve 4: **The trochlear nerve** controls muscles in the eye. It emerges from the back of the midbrain part of the brainstem.
- Cranial nerve 5: **The trigeminal nerve** is the largest and most complex of the cranial nerves, with both sensory and motor function. It originates from the pons and conveys sensation from the scalp, teeth, jaw, sinuses, parts of the mouth and face to the brain, allows the function of chewing muscles, and much more.
- Cranial nerve 6: **The abducens nerve** innervates some of the muscles in the eye.
- Cranial nerve 7: **The facial nerve** supports face movement, taste, glandular and other functions.
- Cranial nerve 8: **The vestibulocochlear nerve** facilitates balance and hearing.
- Cranial nerve 9: **The glossopharyngeal nerve** allows taste, ear and throat movement, and has many more functions.
- Cranial nerve 10: **The vagus nerve** allows sensation around the ear and the digestive system and controls motor activity in the heart, throat and digestive system.
- Cranial nerve 11: **The accessory nerve** innervates specific muscles in the head, neck and shoulder.
- Cranial nerve 12: **The hypoglossal nerve** supplies motor activity to the tongue.

NB/ The first two nerves originate in the cerebrum, and the remaining 10 cranial nerves emerge from the brainstem, which has three parts: the midbrain, the pons and the medulla.

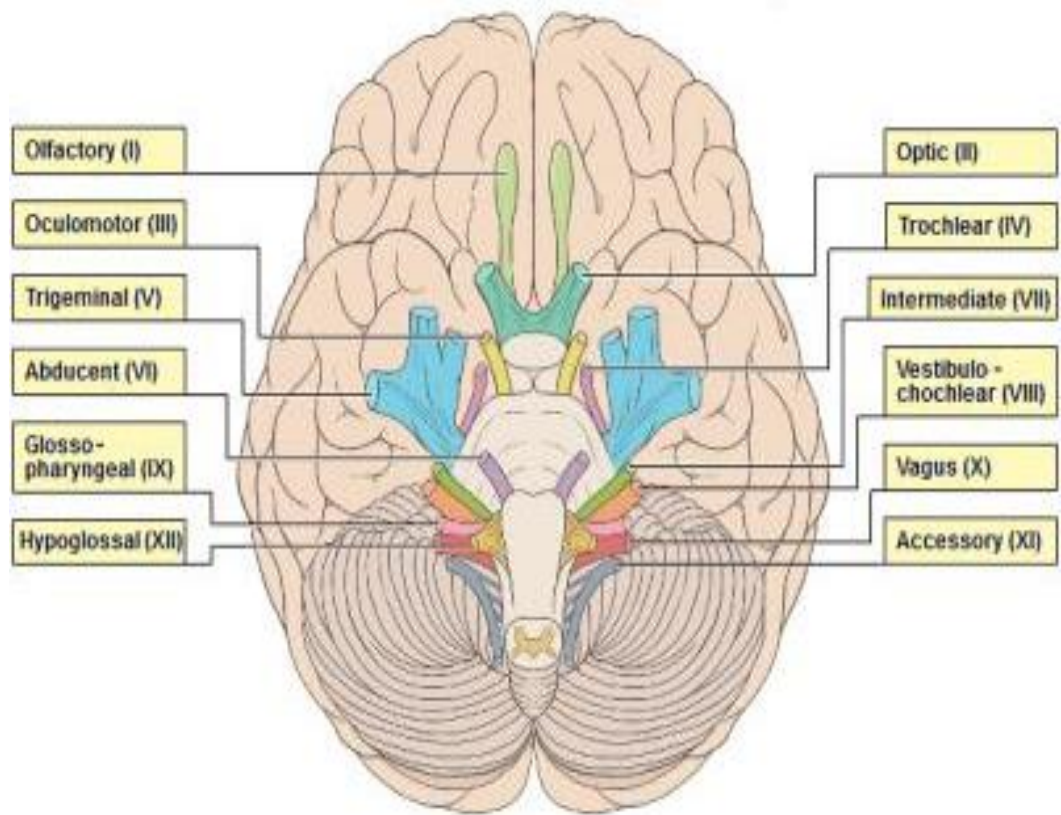


Figure 3
Cranial nerves

IV. The spinal nerves

Spinal nerves are mixed nerves that interact directly with the spinal cord to modulate motor and sensory information from the body's periphery. Each nerve forms from nerve fibers, known as **fila radicularia**, extending from the posterior (dorsal) and anterior (ventral) roots of the spinal cord.

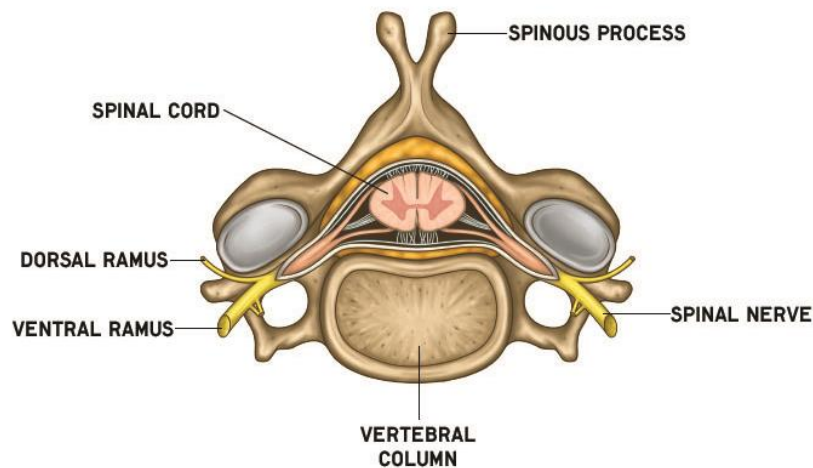


Figure 4

Spinal Nerve Anatomy

V. The cerebellum

The cerebellum (“little brain”) is a fist-sized portion of the brain located at the back of the head, below the temporal and occipital lobes and above the brainstem. Like the cerebral cortex, it has two hemispheres. The outer portion contains neurons, and the inner area communicates with the cerebral cortex. Its function is to coordinate voluntary muscle movements and to maintain posture, balance and equilibrium. New studies are exploring the cerebellum’s roles in thought, emotions and social behavior, as well as its possible involvement in addiction, autism and schizophrenia.

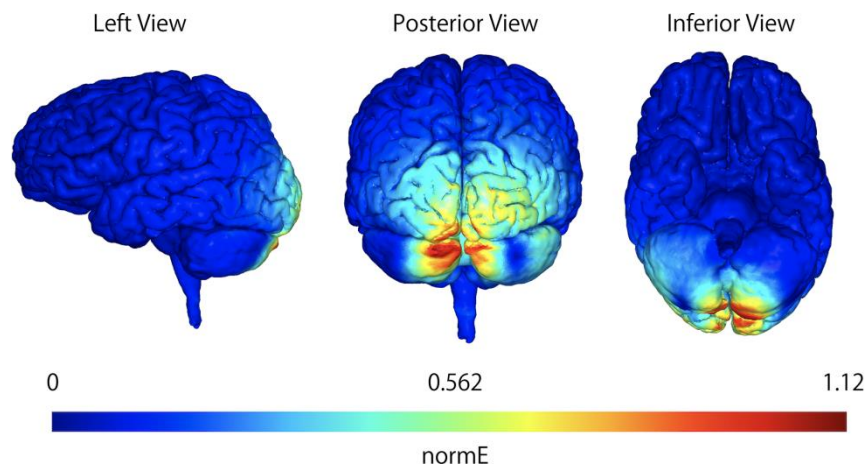
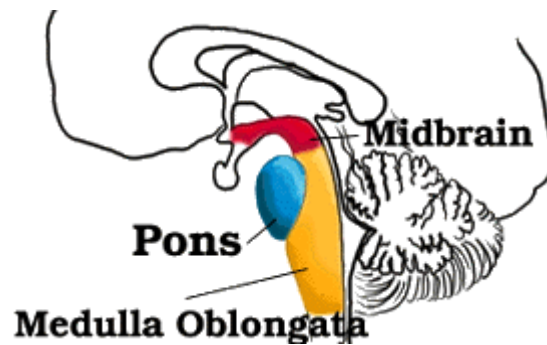


Figure 5

The cerebellum

VI. The brain stem

The brainstem (middle of brain) connects the cerebrum with the spinal cord. The brainstem includes the midbrain, the pons and the medulla.



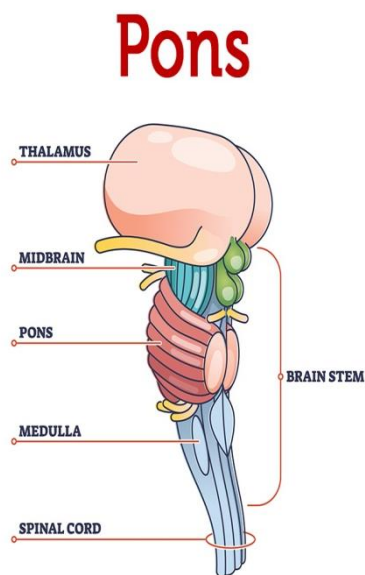
The brain stem

Figure 6

- **Midbrain.** The midbrain (or mesencephalon) is a very complex structure with a range of different neuron clusters (nuclei and colliculi), neural pathways and other structures. These features facilitate various functions, from hearing and movement to calculating responses and environmental changes. The midbrain also contains the substantia nigra, an area affected by Parkinson's disease that is rich in dopamine neurons and part of the basal ganglia, which enables movement and coordination.



- **Pons.** The pons is the origin for four of the 12 cranial nerves, which enable a range of activities such as tear production, chewing, blinking, focusing vision, balance, hearing and facial expression. Named for the Latin word for “bridge,” the pons is the connection between the midbrain and the medulla.



- **Medulla.** At the bottom of the brainstem, the medulla is where the brain meets the spinal cord. The medulla is essential to survival. Functions of the medulla regulate many bodily activities, including heart rhythm, breathing, blood flow, and oxygen and carbon dioxide levels. The medulla produces reflexive activities such as sneezing, vomiting, coughing and swallowing.

VII. The medulla oblongata

It is the lowest part of the brain, and the lowest portion of the brainstem. The medulla oblongata is connected by the pons to the midbrain and is continuous posteriorly with the spinal cord, with which it merges at the opening (foramen magnum) at the base of the skull. The medulla oblongata plays a critical role in transmitting signals between the spinal cord and the higher parts of the brain and in controlling autonomic activities, such as heartbeat and respiration.

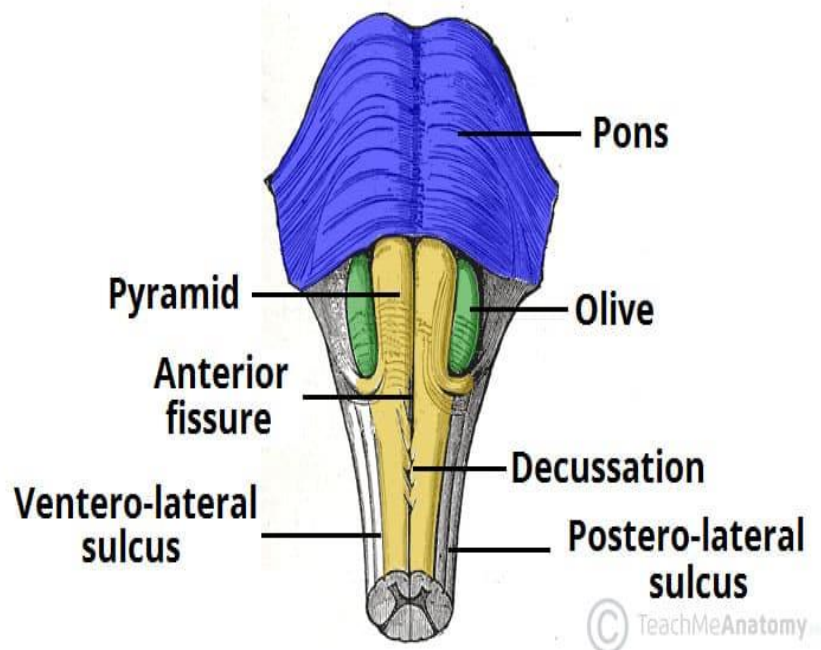


Figure 7

The medulla oblongata

VIII. The mesencephalon/ the midbrain

The midbrain or mesencephalon is the forward-most portion of the brainstem and is associated with vision, hearing, motor control, sleep and wakefulness, arousal (alertness), and temperature regulation. The name comes from the Greek mesos, "middle", and enkephalos, "brain".

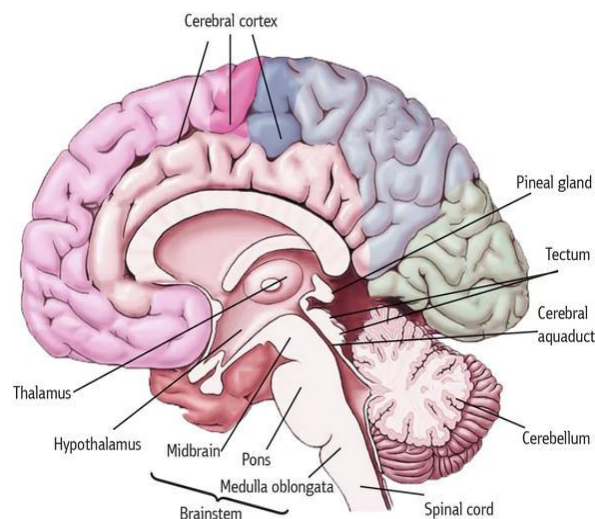


Figure 8

The mesencephalon

IX. The basal ganglia

The “basal ganglia” refers to a group of subcortical nuclei within the brain responsible primarily for motor control, as well as other roles such as motor learning, executive functions, emotional behaviours, and play an important role in reward and reinforcement, addictive behaviours and habit formation.

The basal ganglia are located at the base of the forebrain (cerebrum) and have attracted attention in medicine for various disturbances that appear with dysfunctions caused by diseases or trauma. Disruption of the basal ganglia network forms the basis for several movement disorders example Parkinson's disease, Huntington Disease.

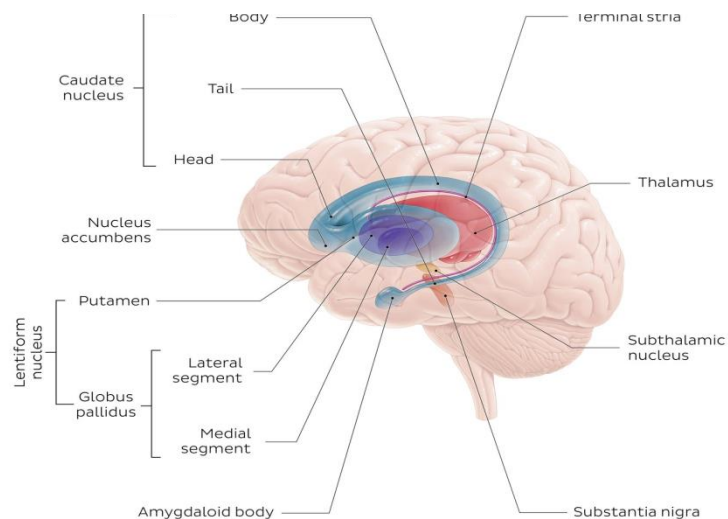


Figure 9

The basal ganglia

x. The dura mater

Dura mater is a thick membrane made of dense irregular connective tissue that surrounds the brain and spinal cord. It is the outermost of the three layers of membrane called the meninges that protect the central nervous system. The other two meningeal layers are the arachnoid mater and the pia mater. It envelops the arachnoid mater, which is responsible for keeping in the cerebrospinal fluid. It is derived primarily from the neural crest cell population, with postnatal contributions of the paraxial mesoderm.

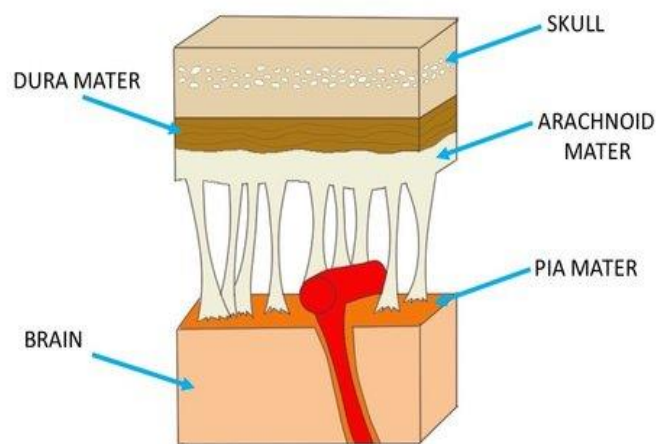


Figure 10

The dura mater

xl. The thalamus

The thalamus is a paired structure of gray matter located in the forebrain which is superior to the midbrain, near the center of the brain, with nerve fibers projecting out to the cerebral cortex in all directions. The medial surface of the thalamus constitutes the upper part of the lateral wall of the third ventricle, and is connected to the corresponding surface of the opposite thalamus by a flattened gray band, the interthalamic adhesion. The lateral part of the thalamus is the phylogenetically newest part of the thalamus (neothalamus), and includes the lateral nuclei, the pulvinar and the medial and lateral geniculate nuclei. There are areas of white matter in the thalamus including the stratum zonale that covers the dorsal surface, and the external and internal medullary laminae. The external lamina covers the lateral surface and the internal lamina divides the nuclei into anterior, medial and lateral groups.



The thalamus

Figure 11

IIX The hypothalamus

The hypothalamus is divided into three regions (supraoptic, tuberal, mammillary) in a parasagittal plane, indicating location anterior-posterior; and three areas (periventricular, medial, lateral) in the coronal plane, indicating location medial-lateral. Hypothalamic nuclei are located within these specific regions and areas.^[5] It is found in all vertebrate nervous systems. In mammals, magnocellular neurosecretory cells in the paraventricular nucleus and the supraoptic nucleus of the hypothalamus produce neurohypophysial hormones, oxytocin and vasopressin.^[6] These hormones are released into the blood in the posterior pituitary.^[7] Much smaller parvocellular neurosecretory cells, neurons of the paraventricular nucleus, release corticotropin-releasing hormone and other hormones into the hypophyseal portal system, where these hormones diffuse to the anterior pituitary.

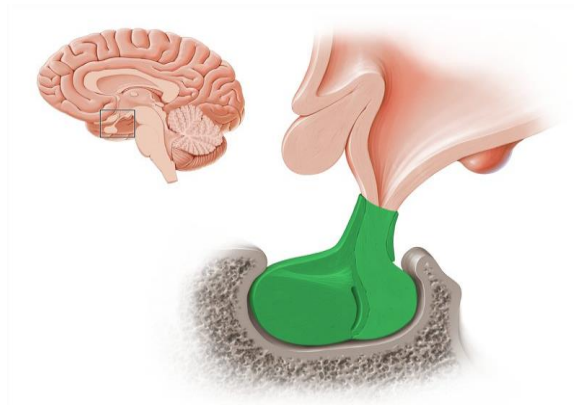


The hypothalamus

Figure 12

I. The pituitary gland/ the hypophysis

The pituitary gland is a small pea-sized gland that plays a major role in regulating vital body functions and general wellbeing. It is referred to as the body's 'master gland' because it controls the activity of most other hormone-secreting glands.



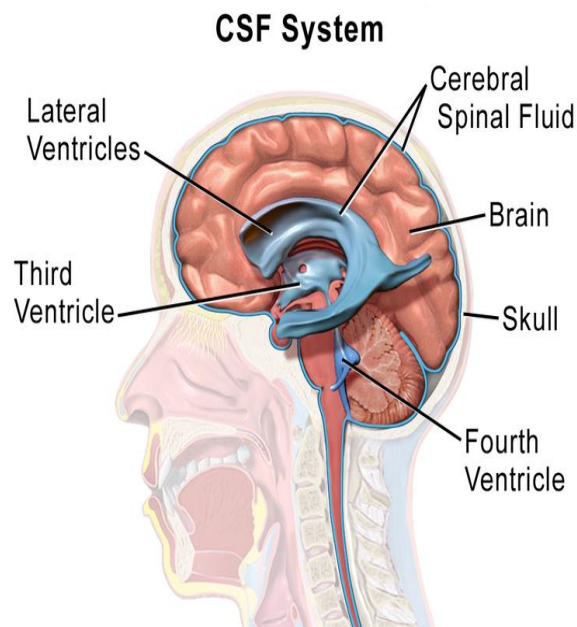
The pituitary gland/ the hypophysis

Figure 13

I. Cerebrospinal fluid (CSF)

Is a clear, colourless body fluid found within the tissue that surrounds the brain and spinal cord of all vertebrates.

CSF is produced by specialised ependymal cells in the choroid plexus of the ventricles of the brain, and absorbed in the arachnoid granulations. There is about 125 mL of CSF at any one time, and about 500 mL is generated every day. CSF acts as a shock absorber, cushion or buffer, providing basic mechanical and immunological protection to the brain inside the skull. CSF also serves a vital function in the cerebral auto regulation of cerebral blood flow.

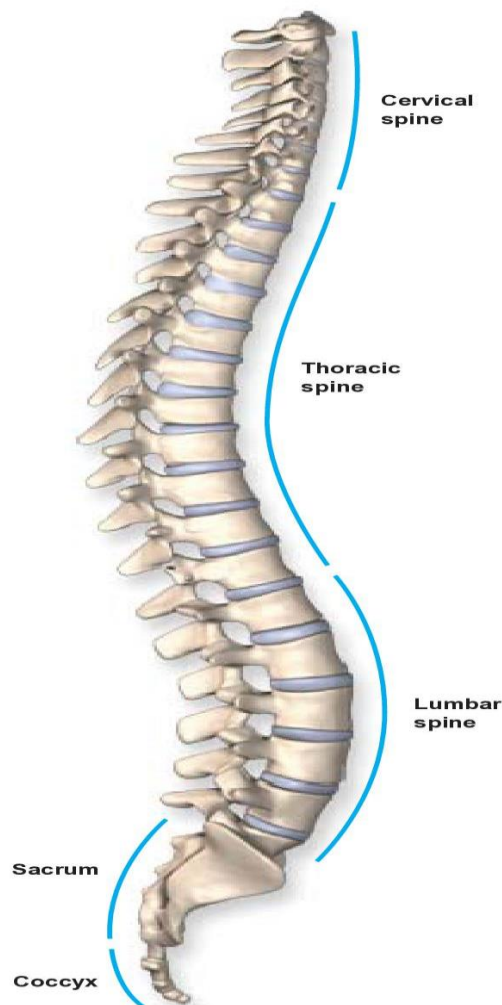


Cerebrospinal fluid (CSF)

Figure 14

II. The spine

The bones, muscles, tendons, and other tissues that reach from the base of the skull to the tailbone. The spine encloses the spinal cord and the fluid surrounding the spinal cord. Also called backbone, spinal column, and vertebral column.

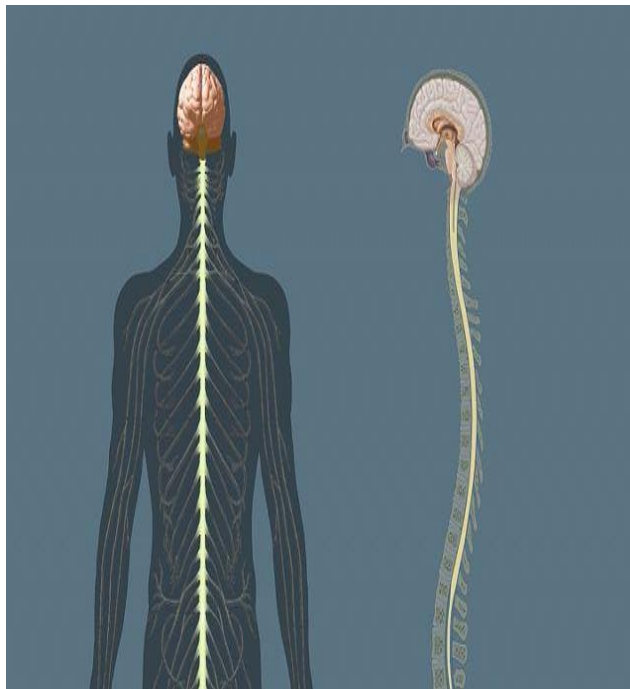


The spine

Figure 15

I. The spinal cord

The spinal cord is a long, thin, tubular structure made up of nervous tissue, which extends from the medulla oblongata in the brainstem to the lumbar region of the vertebral column (backbone). The backbone encloses the central canal of the spinal cord, which contains cerebrospinal fluid.

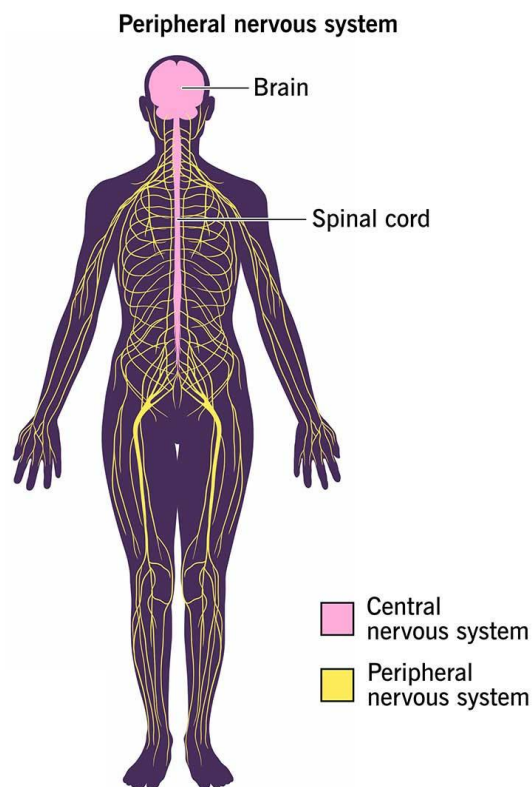


The spinal cord

Figure 16

II. The peripheral nervous system (PNS)

The peripheral nervous system consists of the nerves that branch out from the brain and spinal cord. These nerves form the communication network between the CNS and the body parts. The peripheral nervous system is further subdivided into the somatic nervous system and the autonomic nervous system.

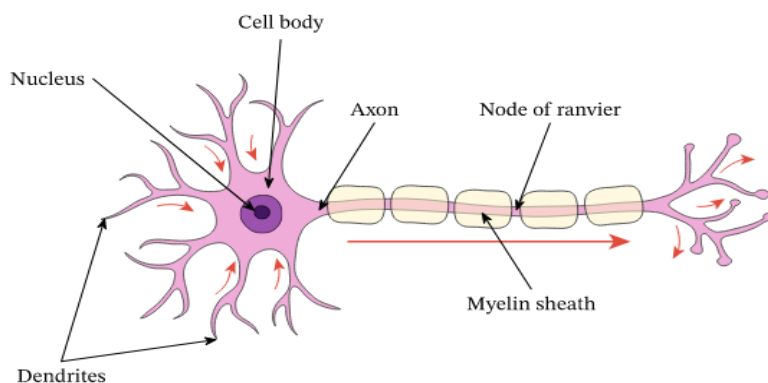


The peripheral nervous system (PNS)

Figure 17

III. Nerve impulse

A nerve impulse is a sudden reversal of the electrical charge across the membrane of a resting neuron. The reversal of charge is called an action potential. It begins when the neuron receives a chemical signal from another cell.



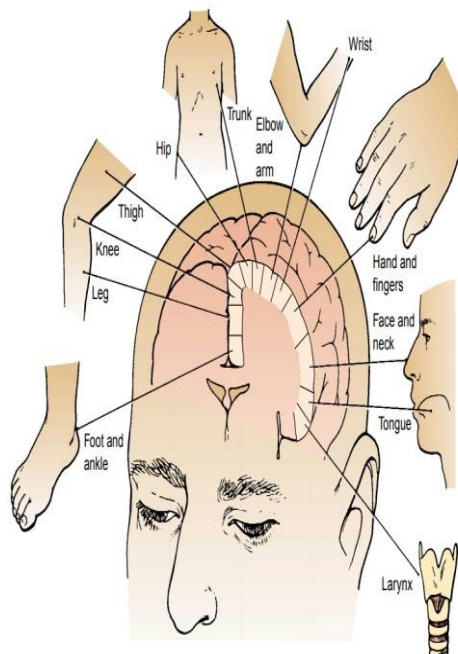
Nerve impulse

Figure 18

I. Motor function

Is an umbrella term used to describe any activity or movement which is completed due to the use of motor neurons.

Motor function is the basic understanding of movement or activity through the use of motor neurons."

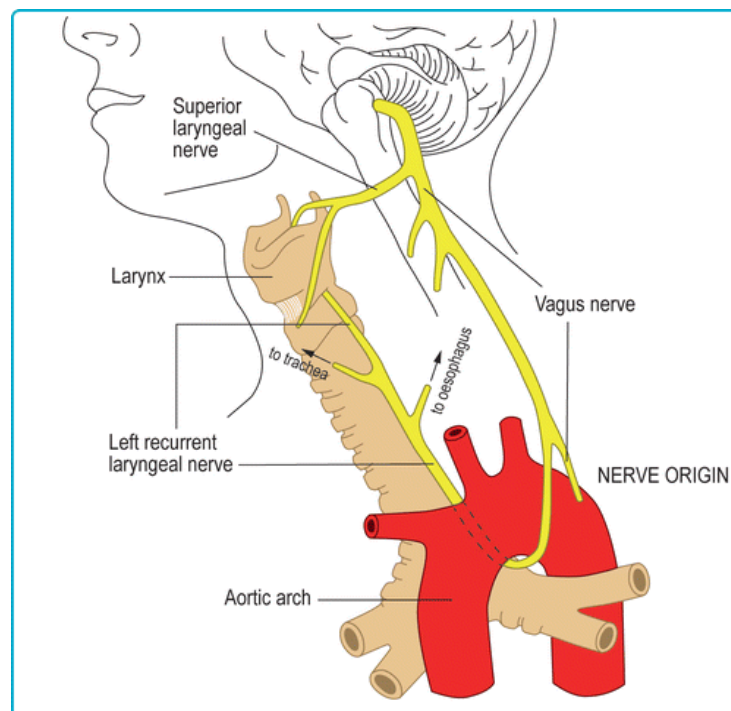


Motor function

Figure 19

I. Vasovagal syncope

Vasovagal syncope (vay-zoh-VAY-gul SING-kuh-pee) occurs when you faint because your body overreacts to certain triggers, such as the sight of blood or extreme emotional distress. It may also be called neurocardiogenic syncope. The vasovagal syncope trigger causes your heart rate and blood pressure to drop suddenly.



Vasovagal syncope

Figure 20

References

Brittanica.com. Encyclopaedia Britannica. August 4, 2015. Retrieved January 29, 2016.

Brain Anatomy and How the Brain Works (The Johns Hopkins University; The Johns Hopkins Hospital, and Johns Hopkins Health system) 2023.

Simple English Wikipedia, the free encyclopedia

Study .com

Very Well Health

TeachMeAnatomy

Skill Lab Learning

Anglais Médical Didier Carnet, Jean Pierre Charpy, Philip Bastable, Philippe de la Grange. (Ellipses)

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Submitted: November 8th, 2016 Reviewed: March 24th, 2017 Published: November 21st, 2017

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