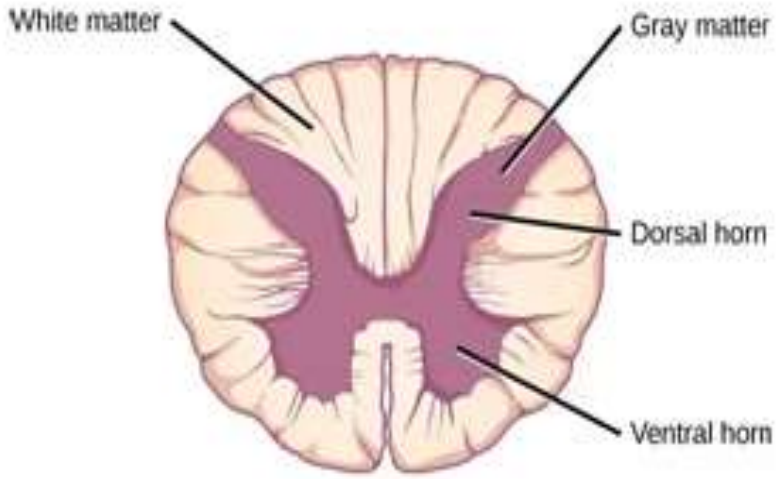
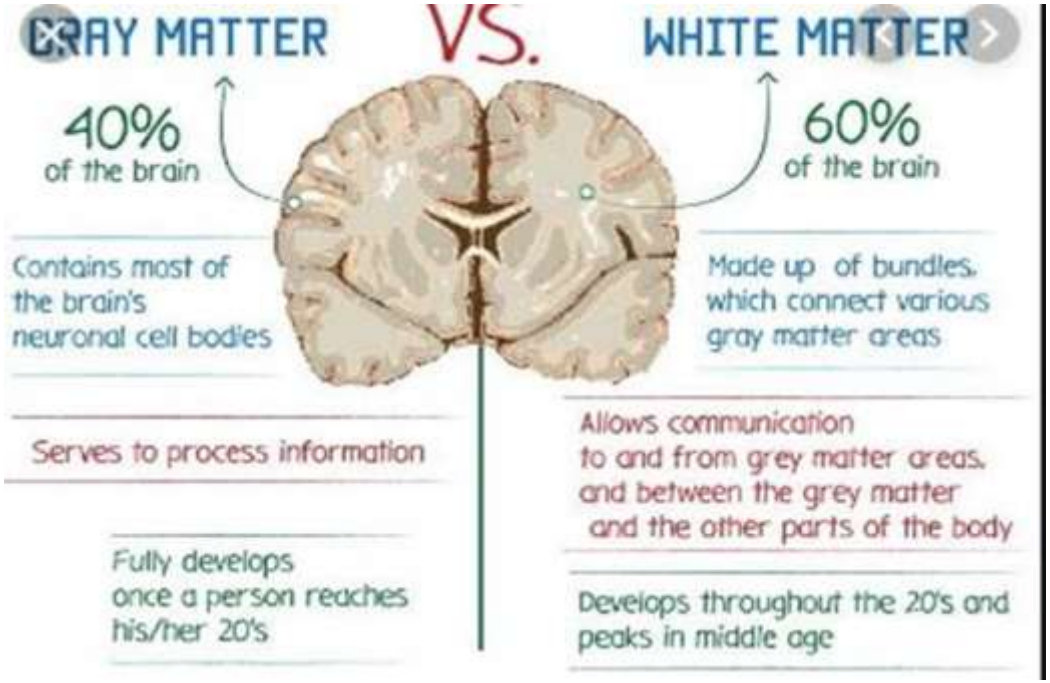

White matter
Gray matter
Dorsal horn
Ventral horn


GRAY MATTER
VS.
WHITE MATTER
40%
of the brain
60%
of the brain
Contains most of the brain's neuronal cell bodies
Made up of bundles, which connect various gray matter areas
Serves to process information
Allows communication to and from grey matter areas, and between the grey matter and the other parts of the body
Fully develops once a person reaches his/her 20's
Develops throughout the 20's and peaks in middle age

White matter:

White matter refers to areas of the central nervous system (CNS) that are mainly made up of myelinated axons, also called tracts. Long thought to be passive tissue, white matter affects learning and brain functions, modulating the distribution of action potentials, acting as a relay and coordinating communication between different brain regions.

White matter is named for its relatively light appearance resulting from the lipid content of myelin. However, the tissue of the freshly cut brain appears pinkish-white to the naked eye because myelin is composed largely of lipid tissue veined with capillaries. Its white color in prepared specimens is due to its usual preservation in formaldehyde.

Structure:

White matter is composed of bundles, which connect various gray matter areas (the locations of nerve cell bodies) of the brain to each other, and carry nerve impulses between neurons. Myelin acts as an insulator, which allows electrical signals to jump, rather than coursing through the axon, increasing the speed of transmission of all nerve signals.

The total number of long range fibers within a cerebral hemisphere is 2% of the total number of cortico-cortical fibers (across cortical areas) and is roughly the same number as those that communicate between the two hemispheres in the brain's largest white tissue structure, the corpus callosum. Schüz and Braitenberg note "As a rough rule, the number of fibres of a certain range of lengths is inversely proportional to their length."

White matter in nonelderly adults is 1.7–3.6% blood.

Location:

White matter forms the bulk of the deep parts of the brain and the superficial parts of the spinal cord. Aggregates of grey matter such as the basal ganglia (caudate nucleus, putamen, globus pallidus, substantia nigra, subthalamic nucleus, nucleus accumbens) and brainstem nuclei (red nucleus, cranial nerve nuclei) are spread within the cerebral white matter.

The cerebellum is structured in a similar manner as the cerebrum, with a superficial mantle of cerebellar cortex, deep cerebellar white matter (called the "arbor vitae") and aggregates of grey matter surrounded by deep cerebellar white matter (dentate nucleus, globose nucleus, emboliform nucleus, and fastigial nucleus). The fluid-filled cerebral ventricles (lateral ventricles, third ventricle, cerebral aqueduct, fourth ventricle) are also located deep within the cerebral white matter.

Myelinated axon length:

Men have more white matter than women both in volume and in length of myelinated axons. At the age of 20, the total length of myelinated fibers in men is 176,000 km while that of a woman is 149,000 km. There is a decline in total length with age of about 10% each decade such that a man at 80 years of age has 97,200 km and a female 82,000 km. Most of this reduction is due to the loss of thinner fibers.

Function:

White matter is the tissue through which messages pass between different areas of gray matter within the central nervous system. The white matter is white because of the fatty substance (myelin) that surrounds the nerve fibers (axons). This myelin is found in almost all long nerve fibers, and acts as an electrical insulation. This is important because it allows the messages to pass quickly from place to place.

Unlike gray matter, which peaks in development in a person's twenties, the white matter continues to develop, and peaks in middle age.