

NAME: AKINBILE GRACE OLUWASEUN

MATRIC NUMBER: 18/MHS02/029

DEPARTMENT: NURSING, 200LVL

COURSE: PHS 212 (PHYSIOLOGY)

ANSWER

THE SOMATOSENSORY PATHWAYS

A somatosensory pathway will typically consist of three neurons: primary, secondary, and tertiary located in the dorsal root ganglion, the spinal cord, and the thalamus.

1. In the periphery, the primary neuron is the sensory receptor that detects sensory stimuli like touch or temperature. The cell body of the primary neuron is housed in the dorsal root ganglion of a spinal nerve or, if sensation is in the head or neck, the ganglia of the trigeminal or cranial nerves.

2. The secondary neuron acts as a relay and is located in either the spinal cord or the brainstem. This neuron's ascending axons will cross, or decussate, to the opposite side of the spinal cord or brainstem and travel up the spinal cord to the brain, where most will terminate in either the thalamus or the cerebellum.

3. Tertiary neurons have cell bodies in the thalamus and project to the post central gyrus of the parietal lobe, forming a sensory homunculus in the case of touch. Regarding posture, the tertiary neuron is located in the cerebellum.

Ascending Pathways: In the spinal cord, the somatosensory system includes ascending pathways from the body to the brain. One major target within the brain is the post central gyrus in the cerebral cortex. This is the target for neurons of the dorsal column–medial lemniscal pathway and the ventral spinothalamic pathway. Note that many ascending somatosensory pathways include synapses in either the thalamus or the reticular formation before they reach the cortex. Other ascending pathways, particularly those involved with control of posture, are projected to the cerebellum, including the ventral and dorsal spinocerebellar tracts. Another important target for afferent somatosensory neurons that enter the spinal cord is the neurons involved with local segmental reflexes.

Parietal Love- Primary Somatosensory Area: The primary somatosensory area in the human cortex is located in the post central gyrus of the parietal lobe. This is the main sensory receptive area for the sense of touch. Like other sensory areas, there is a map of sensory space called a homunculus at this location. Areas of this part of the human brain map to certain areas of the body, dependent on the amount or importance of somatosensory input from that area. For example, there is a large area of cortex devoted to sensation in the hands, while the back has a much smaller area. Somatosensory information involved with proprioception and posture also target an entirely different part of the brain, the cerebellum.

Cortical Homunculus: This is a pictorial representation of the anatomical divisions of the primary motor cortex and the primary somatosensory cortex; namely, the portion of the human brain directly responsible for the movement and exchange of sensory and motor information of the body.

Thalamus: The thalamus is a midline symmetrical structure within the brain of vertebrates including humans; it is situated between the cerebral cortex and midbrain, and surrounds the third ventricle. Its function includes relaying sensory and motor signals to the cerebral cortex, along with the regulation of consciousness, sleep, and alertness.

Main Sensory Trigeminal Pathway: Face Discriminative Touch and Proprioception

The main sensory trigeminal pathway carries and processes discriminative touch and proprioceptive information from the face. Consequently, it is the cranial homologue of the medial lemniscal pathway.

Neospinothalamic Pathway: Body - Sharp Prickling Pain and Cool/Cold

The neospinothalamic pathway carries and processes sharp, pricking pain and dropping temperature (cool/cold) information from the body. The pain information carried by the neospinothalamic pathway is well localized and the sensations are the short lasting “fast” or “first” pain elicited by tissue-damaging cutaneous stimuli. The neospinothalamic pathway is also characterized by somatotopic representation, which allows for accurate localization of the painful stimulus.

Spinal Trigeminal Pathway: Face Pain, Temperature and Crude Touch

The spinal trigeminal pathway carries and processes crude touch, pain and temperature information from the face. Consequently, it is the cranial homologue of the spinothalamic pathways i.e., homologous to all the spinothalamic pathways, the archi-, paleo- and neo-spinothalamic pathways. As in the spinothalamic pathways, the afferents carrying crude touch information are kept separate from those carrying temperature information and from others carrying pain information. Also the trigeminal afferents carrying sharp, cutting pain information are segregated from those carrying dull, burning pain and deep aching pain information.