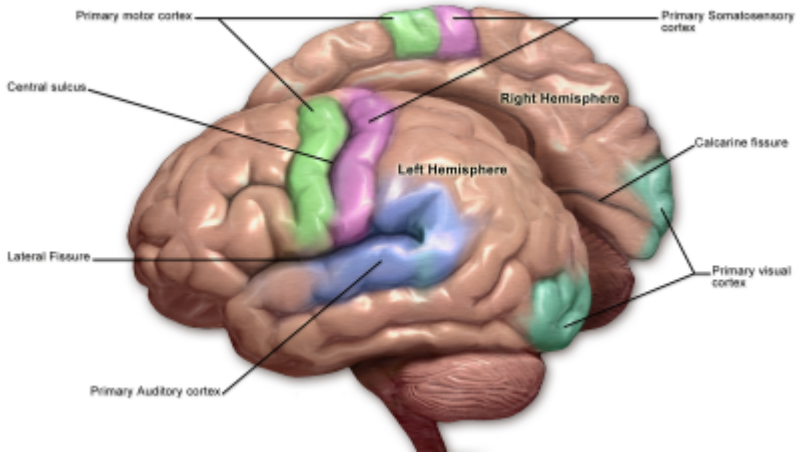
# Primary somatosensory cortex




see also somatosensory system.

The primary somatosensory cortex (SI) is subdivided into four cytoarchitectonic areas, termed Brodmann area 3 3a, 3b, Brodmann area 1 and Brodmann area 2.

In physiological and anatomical studies of non-human primates, it has been demonstrated that there is a complete topographic representation of the body in each of the four Brodmann's areas, and that these areas exhibit a hierarchy in sensory information processing.

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Just posterior to the primary somatosensory cortex lies the somatosensory association cortex, which integrates sensory information from the primary somatosensory cortex (temperature, pressure, etc.) to construct an understanding of the object being felt. Inferior to the frontal lobes are found the olfactory bulbs, which receive sensory input from the olfactory nerves and route those signals throughout the brain. Not all olfactory information is routed to the olfactory cortex. Some neural fibers are routed directly to limbic structures, while others are routed to the supraorbital region of the frontal lobe. Such a direct limbic connection makes the olfactory sense unique.

The brain cortical regions are related to the auditory, visual, olfactory, and somatosensory (touch, proprioception) sensations, which are located lateral to the lateral fissure and posterior to the central sulcus, that is, more toward the back of the brain. The cortical region related to gustatory sensation is located anterior to the central sulcus.

Note that the central sulcus (sometimes referred to as the central fissure) divides the primary motor cortex (on the precentral gyrus of the posterior frontal lobe) from the somatosensory cortex (on the postcentral gyrus of the anterior parietal lobe).

The somatosensory cortex is involved in somatic sensation, visual stimuli, and movement planning.

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Affective touch is a type of sensory information that elicits an emotional reaction and is usually social in nature, such as a physical human touch. This type of information actually coded differently than other sensory information. Intensity of affective touch is still encoded in the primary somatosensory

cortex, but the feeling of pleasantness associated with affective touch activates the anterior cingulate cortex more than the primary somatosensory cortex. Functional magnetic resonance imaging (fMRI) data shows that increased blood oxygen level contrast (BOLD) signal in the anterior cingulate cortex as well as the prefrontal cortex is highly correlated with pleasantness scores of an affective touch. Inhibitory transcranial magnetic stimulation (TMS) of the primary somatosensory cortex inhibits the perception of affective touch intensity, but not affective touch pleasantness. Therefore, the S1 is not directly involved in processing socially affective touch pleasantness, but still plays a role in discriminating touch location and intensity.

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Intrinsic optical imaging as developed by Grinvald et al. is a powerful technique for monitoring neural function in the in vivo central nervous system. The advent of this dye-free imaging has also enabled us to monitor human brain function during neurosurgical operations.

Sato et al briefly describe his own experience in functional mapping of the human somatosensory cortex, carried out using intraoperative optical imaging. The maps obtained demonstrate new additional evidence of a hierarchy for sensory response patterns in the human primary somatosensory cortex [1)].

1)
Sato K, Nariai T, Momose-Sato Y, Kamino K. Intraoperative intrinsic optical imaging of human somatosensory cortex during neurosurgical operations. Neurophotonics. 2017 Jul;4(3):031205. doi: 10.1117/1.NPh.4.3.031205. Review. PubMed PMID: 28018935.