

Functional Areas of Cerebral Cortex

The functions of the cerebrum are numerous and complex. In a general way, the cerebral cortex is divided into sensory, motor, and association areas. The sensory areas interpret sensory impulses, the motor areas control muscular movement, and the association areas are concerned with emotional and intellectual processes.

Sensory Areas

The **primary sensory (somesthetic) area** is located directly posterior to the central sulcus of the cerebrum in the postcentral gyrus of the parietal lobe, it extends from the longitudinal fissure on the top of the cerebrum to the lateral cerebral sulcus.

The primary sensory area receives sensations from cutaneous, muscular, and visceral receptors in various parts of the body. Each point of the area receives sensations from specific parts of the body. The size of the portion of the sensory area receiving stimuli from body parts is not dependent on the size of the part but on the number of receptors the part contains. For example, a larger portion of the sensory area receives impulses from the lips than from the thorax.

The **secondary sensory area** is a small region in the posterior wall of the lateral sulcus in line with the postcentral gyrus. It is involved mainly in less discriminative aspects of sensation.

Posterior to the primary sensory area is the **sensory association area**. It receives input from the thalamus, other lower portions of the brain, and the primary sensory area. Its role is to integrate and interpret sensations. This area permits you to determine the exact shape and texture of an object without looking at it, to determine the orientation of one object to another as they are felt, and to sense the relation of one body part to another. Other role of the sensory association area is the storage of memories of past sensory experiences. Thus, you can compare sensations with previous experiences.

Other sensory areas of the cortex include the following.

1. **Primary visual area.** Located on the medial surface of the occipital lobe and occasionally extends around to the lateral surface. It receives sensory impulses from the eyes and interprets shape, color, and movement.
2. **Visual association area.** Located in the occipital lobe. It receives sensory impulses from the primary visual area and the thalamus. It relates present to past visual experiences with recognition and evaluation of what is seen.

3. **Primary auditory area.** Located in the superior part of the temporal lobe near the lateral cerebral sulcus. It interprets the basic characteristic of sound such as pitch and rhythm. Whereas the anterolateral of the auditory area responds to low pitches, the posterolateral portion responds to high pitches.
4. **Auditory association area.** Inferior to the primary auditory area in the temporal cortex. It determine if a sound is speech, music, or noise. It also interprets the meaning of speech by translating words into thoughts.
5. **Primary gustatory area.** Located at the base of the postcentral gyrus above the lateral cerebral sulcus in the parietal cortex. It interprets sensations related to taste.
6. **Primary olfactory area.** Located in the temporal lobe on the medial aspect. It interprets sensations related to smell.
7. **Gnostic area.** (Gnosis=knowledge) This common integrative area is located among the sensory, visual, and auditory association areas. It receives nerve impulses from these areas so that a common thought can be formed from the various sensory inputs. It then transmits signals to other parts of the brain to cause the appropriate response to the sensory signal.

Motor Area

The **primary motor area** is located in the precentral gyrus of the frontal lobe. Like the primary sensory area, the primary motor area consists of regions that control specific muscles or groups of muscles. Stimulation of a specific point of the primary motor area results in a muscular contraction, usually on the opposite side of the body.

The **premotor area** is anterior to the primary. It is concerned with learned motor activities of complex and sequential nature. For example, writing. Thus, the premotor area controls skilled movements.

The **frontal eye field area** in the frontal cortex is sometimes included in the premotor area. This area controls voluntary scanning movements of the eye. Searching for a word in a dictionary, for instance.

The **language areas** are also significant parts of the motor cortex. The translation of speech or written words into thoughts involves sensory areas (primary auditory, auditory association, primary visual, visual association, and Gnostic). The translation of thoughts into speech involves the **motor speech area**, located in the frontal lobe just superior to the lateral cerebral sulcus. From this area, a sequence of nerve impulses is sent to the premotor region that controls the muscle of the larynx,

pharynx, and mouth. The nerve impulses from the premotor area to the muscle result in specific, coordinated contractions that enable you to speak.