Cranial Nerves

- Twelve pairs of cranial nerves arise from the brain
- They have sensory, motor, or both sensory and motor functions
- Each nerve is identified by a number (I through XII) and a name
- Four cranial nerves carry parasympathetic fibers that serve muscles and glands
Cranial Nerves

Figure 13.5a

Summary of Function of Cranial Nerves

<table>
<thead>
<tr>
<th>Cranial nerves I – VI</th>
<th>Sensory function</th>
<th>Motor function</th>
<th>PS* fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Olfactory</td>
<td>Yes (smell)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>II Optic</td>
<td>Yes (vision)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>III Oculomotor</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>IV Trochlear</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>V Trigeminal</td>
<td>Yes (general sensation)</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>VI Abducens</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cranial nerves VII – XII</th>
<th>Sensory function</th>
<th>Motor function</th>
<th>PS* fibers</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII Facial</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>VIII Vestibulo-cochlear</td>
<td>Yes (hearing and balance)</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>IX Glossopharyngeal</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>X Vagus</td>
<td>Yes (taste)</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>XI Accessory</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>XII Hypoglossal</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

(b) *PS = parasympathetic

Figure 13.5b
Cranial Nerve I: Olfactory

- Arises from the olfactory epithelium
- Passes through the cribriform plate of the ethmoid bone
- Fibers run through the olfactory bulb and terminate in the primary olfactory cortex
- Functions solely by carrying afferent impulses for the sense of smell
Cranial Nerve II: Optic

- Arises from the retina of the eye
- Optic nerves pass through the optic canals and converge at the optic chiasm
- They continue to the thalamus where they synapse
- From there, the optic radiation fibers run to the visual cortex
- Functions solely by carrying afferent impulses for vision
Cranial Nerve III: Oculomotor

- Fibers extend from the ventral midbrain, pass through the superior orbital fissure, and go to the extrinsic eye muscles

- Functions in raising the eyelid, directing the eyeball, constricting the iris, and controlling lens shape

- Parasympathetic cell bodies are in the ciliary ganglia
Cranial Nerve IV: Trochlear

- Fibers emerge from the dorsal midbrain and enter the orbits via the superior orbital fissures; innervate the superior oblique muscle
- Primarily a motor nerve that directs the eyeball

Figure IV from Table 13.2
Cranial Nerve V: Trigeminal

- Three divisions: ophthalmic \( (V_1) \), maxillary \( (V_2) \), and mandibular \( (V_3) \)

- Fibers run from the face to the pons via the superior orbital fissure \( (V_1) \), the foramen rotundum \( (V_2) \), and the foramen ovale \( (V_3) \)

- Conveys sensory impulses from various areas of the face \( (V_1) \) and \( (V_2) \), and supplies motor fibers \( (V_3) \) for mastication
Cranial Nerve VI: Abducens

- Fibers leave the inferior pons and enter the orbit via the superior orbital fissure
- Primarily a motor nerve innervating the lateral rectus muscle

Cranial Nerve VII: Facial

- Fibers leave the pons, travel through the internal acoustic meatus, and emerge through the stylomastoid foramen to the lateral aspect of the face
- Mixed nerve with five major branches
- Motor functions include facial expression, and the transmittal of autonomic impulses to lacrimal and salivary glands
- Sensory function is taste from the anterior two-thirds of the tongue
Cranial Nerve VII: Facial

- Figure VII from Table 13.2

Cranial Nerve VIII: Vestibulocochlear

- Fibers arise from the hearing and equilibrium apparatus of the inner ear, pass through the internal acoustic meatus, and enter the brainstem at the pons-medulla border

- Two divisions – cochlear (hearing) and vestibular (balance)

- Functions are solely sensory – equilibrium and hearing
Cranial Nerve VIII: Vestibulocochlear

- Fibers emerge from the medulla, leave the skull via the jugular foramen, and run to the throat

- Nerve IX is a mixed nerve with motor and sensory functions

- Motor – innervates part of the tongue and pharynx, and provides motor fibers to the parotid salivary gland

- Sensory – fibers conduct taste and general sensory impulses from the tongue and pharynx
Cranial Nerve IX: Glossopharyngeal

- Parotid gland
- Parasympathetic fibers

Cranial Nerve X: Vagus

- The only cranial nerve that extends beyond the head and neck
- Fibers emerge from the medulla via the jugular foramen
- The vagus is a mixed nerve
- Most motor fibers are parasympathetic fibers to the heart, lungs, and visceral organs
- Its sensory function is in taste
Cranial Nerve X: Vagus

- Formed from a cranial root emerging from the medulla and a spinal root arising from the superior region of the spinal cord.
- The spinal root passes upward into the cranium via the foramen magnum.
- The accessory nerve leaves the cranium via the jugular foramen.

Cranial Nerve XI: Accessory

- Formed from a cranial root emerging from the medulla and a spinal root arising from the superior region of the spinal cord.
- The spinal root passes upward into the cranium via the foramen magnum.
- The accessory nerve leaves the cranium via the jugular foramen.
Cranial Nerve XI: Accessory

- Primarily a motor nerve
  - Supplies fibers to the larynx, pharynx, and soft palate
  - Innervates the trapezius and sternocleidomastoid, which move the head and neck
Cranial Nerve XII: Hypoglossal

- Fibers arise from the medulla and exit the skull via the hypoglossal canal
- Innervates both extrinsic and intrinsic muscles of the tongue, which contribute to swallowing and speech