

Reflex Arc

The nervous system consists of two main parts: the central nervous system (CNS) and the peripheral nervous system (PNS).

- The CNS contains the brain and spinal cord.
- The PNS consists mainly of nerves. Nerves that transmit signals from the brain are called motor or efferent nerves, while those nerves that transmit information from the body to the CNS are called sensory or afferent.

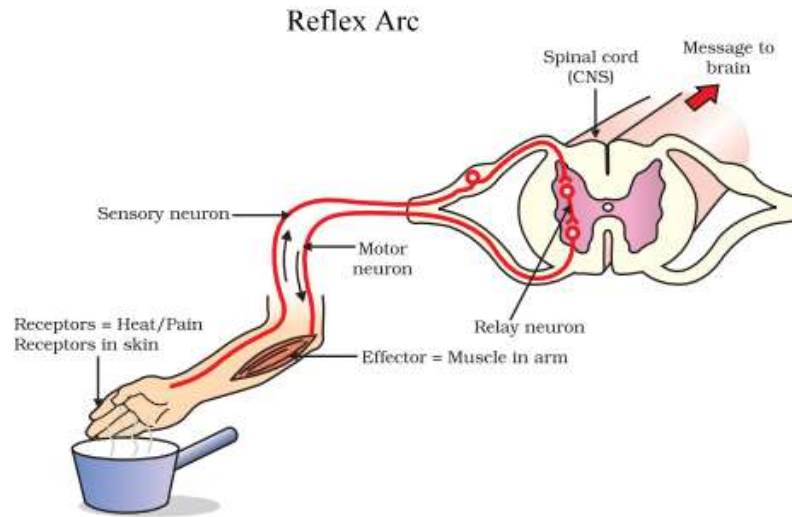
The instant movement performed by the individual in response to the stimulus is known as a **reflex action**. The spinal cord along with the brain stem is responsible for the reflex movements in a reflex action.

The whole mechanism of reflex action occurs in such a fashion that there is no conscious control of the brain. Stimulation occurs through the peripheral nervous system and the response to this peripheral nerve stimulation is involuntary.

The reflex arc describes the pathway in which the nerve impulse is carried and the response is generated and shown by the effector organ.

The reflex arc typically consists of five components:

1. **The receptor** is present in the receptor organ.
2. **The sensory neuron(afferent)** conducts the nerve impulses towards the central nervous system (CNS).
3. **The integration center** consists of one or more synapses in the CNS, and processes the information.
4. **A motor neuron (efferent)** conducts the response nerve from the CNS to the effector organ.
5. **The effector organ** shows response by contracting or secreting a product.



Examples of reflex action are:

- When light acts as a stimulus, the pupil of the eye changes in size.
- Sudden jerky withdrawal of hand or leg when pricked by a pin.
- Coughing or sneezing, because of irritants in the nasal passages.
- Knees jerk in response to a blow or someone stamping the leg.
- The sudden removal of the hand from a sharp object.
- Sudden blinking when an insect comes very near to the eyes.

Purpose of the Reflexes tests:

1. Reflex testing is an important diagnostic tool for assessing the general health of the nervous system.
2. Distorted, exaggerated or absent reflexes may indicate pathology.
3. If the spinal cord is damaged, reflex tests can help pinpoint the level of damage

There are two types of reflex arc:

Autonomic Reflexes:

- Autonomic reflexes control and regulate smooth muscle cells, cardiac muscle cells and glands. In general, these reflexes contain the same basic components as somatic.
- Examples of Autonomic Reflexes:
 1. Pupillary-pupil constricts on both sides when shine a light into the eye.
 2. Accomodation-focus on distant object, then near object-pupil constricts on both sides.

Somatic Reflexes

- Somatic reflex arc (affecting skeletal muscles).
- A skeletal muscle reflex mediated by the brainstem and spinal cord result in an involuntary contraction of skeletal muscle.
- Examples of Somatic reflexes:
 1. Corneal- blink reflex (respond to stimulus)
 2. Patellar: knee jerk

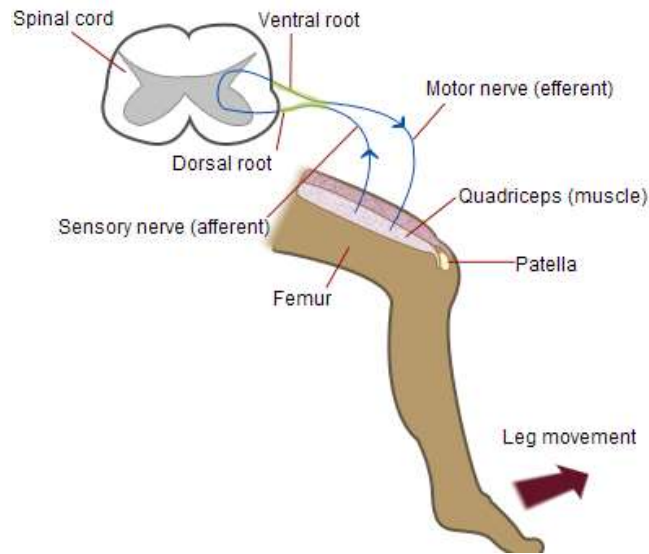
Somatic Reflexes: Patellar Reflex test

- The patellar (or knee-jerk) reflex is called a stretch reflex because it is initiated by tapping a tendon, which stretches the muscle.
- Stretch reflexes generally act to maintain posture, balance and locomotion.

Purpose of testing: -

- After the tap of a hammer, the leg is normally extended once and comes to rest.
- The absence or decrease of this reflex is problematic, and known as Westphal's sign.
- This reflex may be diminished or absent in lower motor neuron lesions and during sleep.
- The test itself assesses the nervous tissue between and including the L2 and L4

segments of the spinal cord.



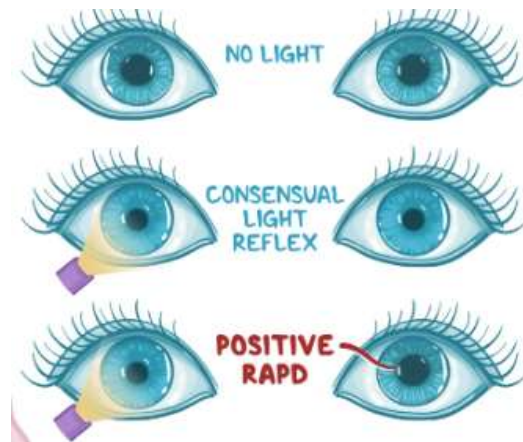
Patellar Reflex test

Autonomic Reflexes: pupillary reflexes test

- The pupillary light reflex (PLR) is a reflex that controls the diameter of the pupil, in response to the intensity of light.
- A greater intensity of light causes the pupil to constrict (miosis) allowing less light in, whereas a lower intensity of light causes the pupil to dilate (mydriasis, expansion) allowing more light in.
- For example, if light is shone into the right eye only, the right pupil constriction is a direct pupillary light reflex, and simultaneous left pupil constriction is a consensual pupillary light reflex.
- Comparing these two responses in both eyes is helpful in locating a lesion.

Purpose of testing:

- Pupillary light reflex can distinguish between damage to CN II (the optic nerve) and damage to CN III (the oculomotor nerve)
- The optic nerve controls the direct pupillary light reflex.
- The oculomotor nerve, controls the consensual pupillary light reflex



pupillary reflexes test