

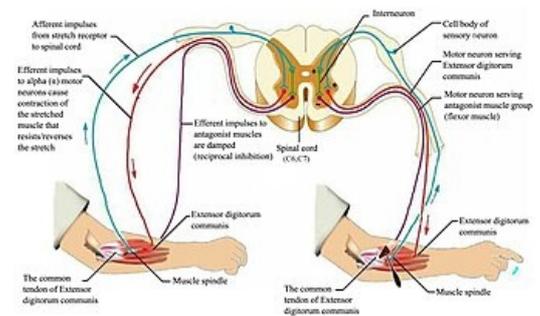
# Examination of tendon-muscle reflexes and skin sensitivity

The basic functional unit of the nervous system is the reflex. It is the body's response to receptor irritation. The response path of the organism is the **reflex arc**, which has 5 parts.

The first part is a sensor in the form of a **receptor**. This is followed by a centripetal (**afferent**) pathway to the center in the CNS. From the center, the reflex arc continues through the centrifugal (**efferent**) path to the **effector**, i.e. the executive organ."

## Proprioceptive reflexes (myotatic reflexes)

These reflexes have a spinal-segmental arrangement and they are activated by hitting the tendon with a neurological hammer. The aim of this stroke is to cause a sudden, short and sharp stretch of the muscle, which irritates the proprioceptors that are located in the muscles. They originate from muscle spindles, which are the muscle tension receptors. From an anatomical point of view, we can divide them into monosynaptic, bisynaptic and polysynaptic.



The extensor digitorum reflex

## Monosynaptic reflex

It represents the stretching reflex. Its pathway begins in the muscle spindle, runs through the spinal nerve to the spinal ganglion, and continues through the posterior root of the spinal cord to the synapse on the  $\alpha$ -motoneuron. The efferent path of the reflex begins with the  $\alpha$ -motoneuron, which leads through the anterior spinal root to the motor nerve and ends with the motor plate on the striated muscle fiber of the effector.

A typical representative of a reflex is:

- patellar reflex
- triceps reflex
- bicipital reflex
- Achilles tendon reflex
- masseter reflex.

All these stretching reflexes cause a rapid contraction of the muscle and are therefore referred to in the clinic as physical stretching. These reflexes disappear after cutting the relevant nerve, they do not disappear after cutting the spinal cord.

## Bisynaptic reflexes

An interneuron is inserted into the path of this reflex arc, which usually has the nature of an inhibitory interneuron. For examination of myotatic reflexes we need a neurological hammer. When equipping the reflexes itself, we notice and evaluate the nature and intensity of the reflex response. The intensity of the response can be reduced or increased against the norm. In such cases, we speak of hyporeflexia or hyperreflexia. In some cases, it is not possible to equip the reflex at all, then we speak of areflexia.

## Individual reflexes

As part of the examination of reflexes on the upper limb, the biceps and triceps reflex is tested.

### Biceps reflex

The biceps reflex has its center in the spinal cord segment C4–C5. We train the reflex by striking the tendon of the biceps brachii muscle (lacertus fibrosus) with a neurological hammer. At the same time, the examinee's arm is slightly flexed and rested on the examiner's forearm. Flexion of the forearm is a reflex response to a hammer blow.

### Triceps reflex

The triceps reflex, which has its center in the spinal cord segment C5–C7, is elicited by hitting the tendon of the triceps brachii just in front of the olecranon. At the same time, the examined person has a limb flexed at the elbow and rested limply over the examiner's forearm. The reflex response is the extension of the examinee's forearm.

Examination of the lower limb includes the patellar reflex and the Achilles tendon reflex.

## Patellar reflex

The center of this reflex is the spinal segment L2–L4. For the examination of this reflex, it is important that the examined lower limb of the examined person hangs freely, limply. It is possible to use a limb hanging from a couch, or to ask the examinee to sit with the lower limbs crossed (leg over leg). We trigger the reflex by striking the ligamentum patellae with a neurological hammer. The response to this examination should be lower leg extension.

## Achilles tendon reflex

The center for this reflex is in the spinal cord segment L5–S2. For this reflex, it is necessary for the examinee to kneel on a chair (lounger) so that only the knee and part of the lower leg are touching and the foot is outside the chair. We trigger a reflex response by tapping on the Achilles tendon. The result is an extension of the leg.

During all these reflexes, the examined limbs are in a semi-flexed position. The answer can be disturbed and thus influenced by conscious as well as unconscious changes in the muscle tone of the examinee. Therefore, so-called amplification maneuvers can be used to distract the person under investigation. When examining the reflexes on the lower limbs, we ask the examinee to bring his hands together in front of his chest and pull them apart with all his strength.

## Exteroreceptive reflexes

Cutaneous sensitivities, like proprioceptive reflexes, have a segmental arrangement. The reflex response to the irritation of a certain skin area to a tactile stimulus is the contraction of a muscle or an entire muscle group. The examination is most often performed on the abdominal muscles, where the response to irritation of skin receptors is the contraction of muscle groups.

### Upper abdominal skin reflex

The upper abdominal skin reflex has its center in the Th7–Th9 spinal cord segment. We induce this reflex by irritating the skin of the epigastrium with a light pull with a pointed object from the midline in a lateral direction. The response to this irritation is a unilateral contraction of the abdominal muscles in the epigastrium.

### Central abdominal reflex

This reflex has its center in the Th9–Th10 spinal segment. It is elicited in the same way as the upper abdominal reflex. And the answer is evaluated anyway.

### Lower abdominal reflex

The center is in the Th11–Th12 spinal segment. The elicitation and response is similar to the upper abdominal reflex.

## Link

### Related articles

- Muscle spindle
- Golgi tendon body
- Spinal medulla

### YouTube video of reflex demonstration

Patellar reflex (<https://www.youtube.com/watch?v=QqZ12A7sfig>)

Triceps reflex (<https://el.lf1.cuni.cz/neuronorma/default/video/video20.html>)

Biceps reflex (<https://el.lf1.cuni.cz/neuronorma/default/video/video18.html>)

Achilles tendon reflex - a physiological finding (<https://el.lf1.cuni.cz/neuronorma/default/video/video31.html>)

### References

- PETROVICKÝ, Pavel. *Anatomie s topografií a klinickými aplikacemi*. 1. edition. Osveta, 2002. 560 pp. ISBN 80-8063-047-X.
- TROJAN, Stanislav. *Lékařská fyziologie*. 4. edition. Grada, 2003. 772 pp. ISBN 80-247-0512-5.