

SPINAL REFLEX: THE PATELLAR REFLEX

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David B. Fankhauser, Professor of Biology and Chemistry
Clermont College, Batavia, OH 45103

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A spinal reflex is one in which the decision to react to an environmental stimulus is made at the level of the spinal cord, allowing extremely rapid reaction without waiting for the participation of the brain. Protective reactions and postural adjustments are typical examples of this kind of spinal reflex.

Typically it will involve a mono- or bisynaptic reflex arc consisting of a sensory neuron, an internuncial (association) neuron, and a motor neuron. We will explore the best know of spinal reflexes, a stretch reflex called the patellar reflex (a monosynaptic reflex).

Illustrate on a full page a generalized bisynaptic reflex pathway labeling participating neurons and other related features (in bold). Note that we are *pretending* that the patellar reflex is bisynaptic... (Remember that it is *monosynaptic*.)

ILLUSTRATE A BISYNAPTIC REFLEX ARC:

- 1) **Muscle spindles** (transducers in quadriceps) become stretched. Golgi tendon organs in the ligament *may* detect increased tension, but usually only when active contraction occurs. Axons from the spindles are carried towards the spinal cord via **spinal nerves**.
- 3) **dorsal root ganglia** (DRG) receive sensory impulses carried by the spinal nerve. The dendrites of the DRG carry the impulse via the **dorsal root** into the spinal cord. For the patellar reflex, the sensory axon goes directly to the anterior grey horn where it stimulates a motor neuron (go straight to step 6 for monosynaptic arcs).
- 4) **IF IT WERE BISYNAPTIC:** The DRG axon would carry the impulse into the **posterior gray horn** of the spinal cord, where it would synapse with an **internuncial neuron**.
- 5) The internuncial neuron would send an impulse to a **motor neuron** in the **anterior gray horn**.
- 6) The motor neuron sends an impulse out through the **ventral root** to the **quadriceps femoris**, causing contraction the action of which is extension of the leg (kick).

PERFORM A PATELLAR REFLEX DEMONSTRATION:

- 1) Sit on edge of table or with legs crossed so that one leg swings freely.
- 2) Locate the soft space between the tibial tuberosity and the lower edge of patella.
- 3) Strike sharply in the center of the soft space between these two hard landmarks with the pointed end of a percussion hammer.
- 4) Experiment with striking in various locations to see where the most pronounced reaction is elicited. Repeat for the other leg.
- 5) Describe the reflexive reactions of the R versus the L leg, compare yours with your bench mates.