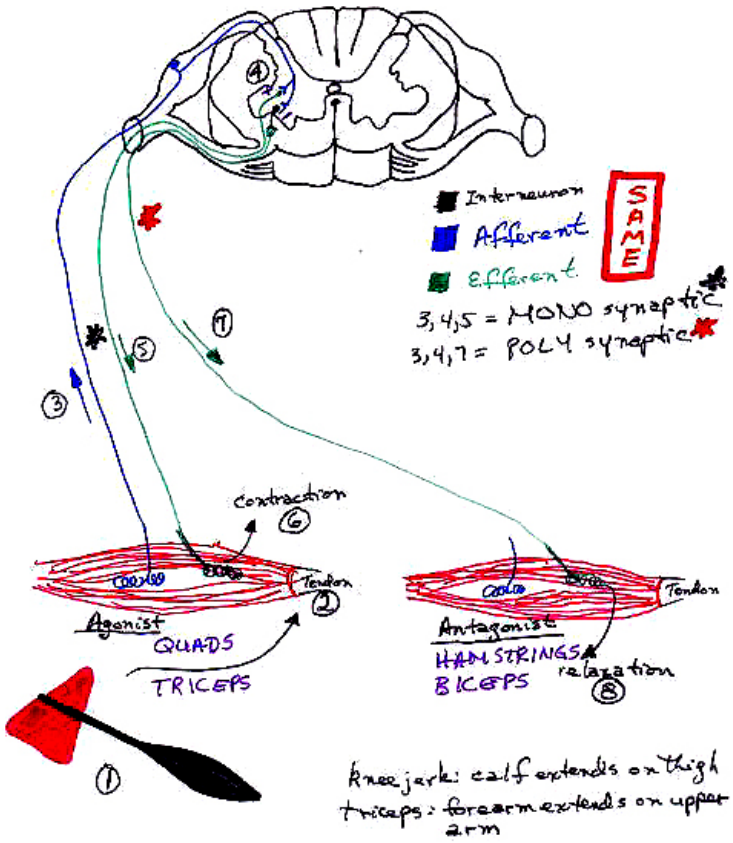
Reflex Testing in The Laboratory

Introductory Background

Reflex testing is another way of obtaining information about a patient by health care personnel. Many of us are acquainted with some reflexes by virtue of having physical exams, e.g., patellar reflex (knee jerk), biceps, triceps, corneal and Achilles' tendon reflex.

This section deals with, essentially, circuitry of a biological nature. In order to understand this circuitry, it's important to have a fundamental grasp of the "parts" that make up this circuitry.

The graphic, below, provides us with an introduction to this concept:

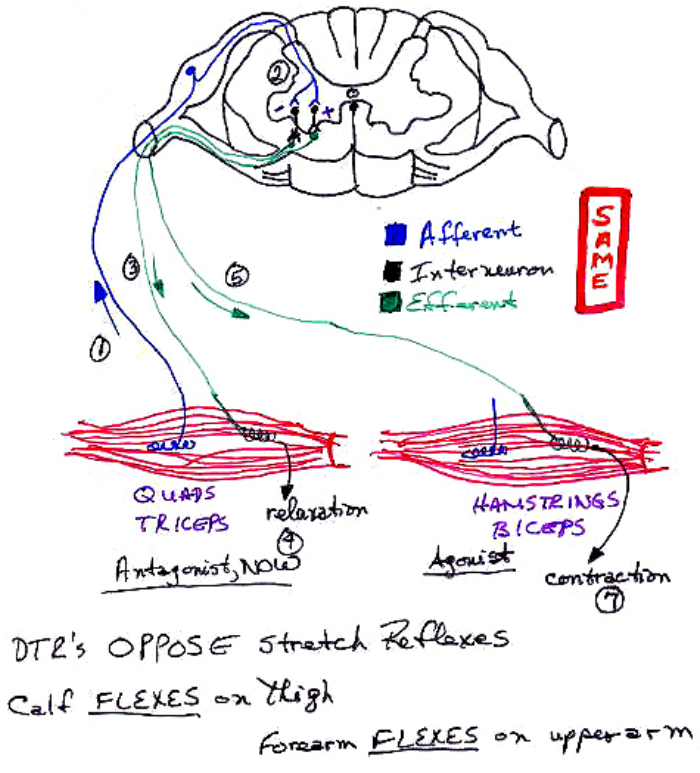


A sensory (or afferent; AH fair unt) neuron picks up input (#1, above) and sends it to the spinal cord (#3, above). The portion of a neuron that brings the signal to the cell body is called the dendrite; the portion that sends the signal away from the cell body is called an axon (#5, above). When axons and dendrites from other cells have to communicate, they do so through a microscopic space called a synapse. In some instances, input has to be sent to the brain for interpretation. In others, it's interpreted right in the spinal cord and

signals are sent out (motor or efferent; EE fair unt) to the effector organ. In simple stretch reflexes, only two neurons are involved: sensory and motor, graphic, above. In this figure, a stretch reflex is illustrated. The way it works is in this manner: 1) a tendon is stimulated (in this illustration by a reflex hammer), 2) the spindle (blue coil in the diagram) detects this stimulus and sends the input to the cord, 3) the information crosses one synapse (mono-synaptic) to a motor neuron that sends output to the spindle (green coil in diagram) and the muscle contracts. That's on the monosynaptic stretch reflex side.

Remember, though, that muscles operate in functional groups antagonistically to each other. In order, for example, for the quadriceps to contract, the hamstrings have to relax. This is accomplished through polysynaptic (more than one synapse) reflexes. In the case of our current example, 1) when the tendon is stimulated, then 2) the sensory neuron sends signals ALSO to interneurons (or association neurons) in the cord. These interneurons are "connectors" that send signals to other motor neurons. These other neurons then send output to the spindles to cause the hamstrings to relax. Another group of muscles that are antagonistic to each other are the biceps and triceps muscles. In the patellar (or knee jerk) reflex, the calf extends on the thigh; in the triceps reflex, the forearm extends on the upper arm.

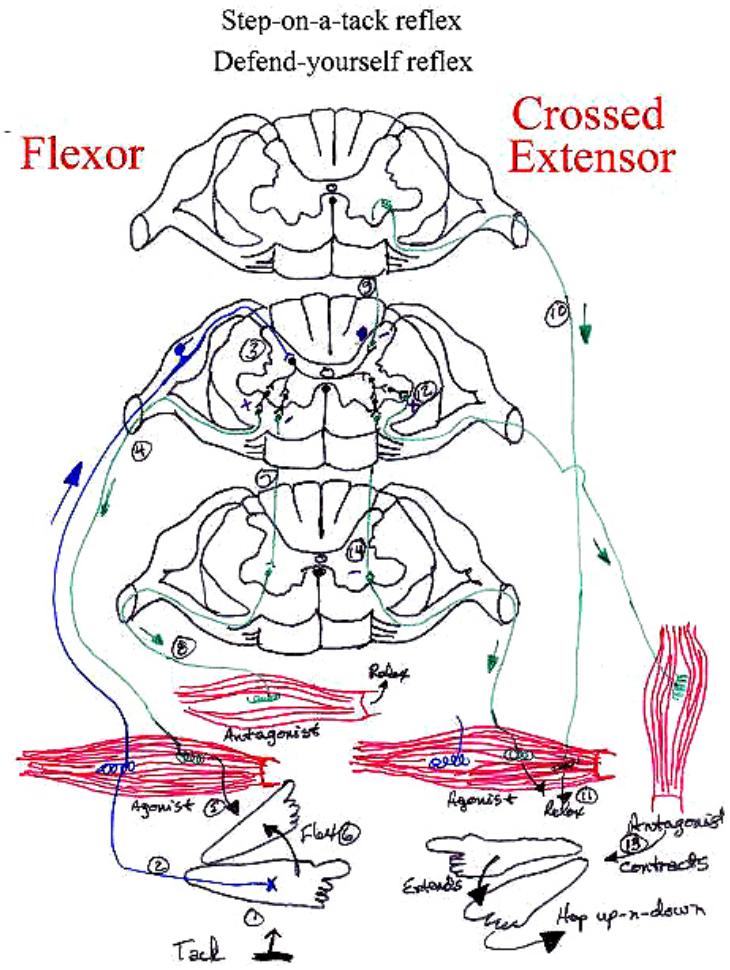
Now that we've got the calf extended, we have to get it flexed back. The following graphic illustrates how this occurs through deep tendon reflexes (DTR's):



Sensory input from the quadriceps telling the cord that the quads are fully contracted is sent to the cord. Once the stimulus is detected at the cord, signals are sent to the two

groups of muscles via two interneurons. One signal tells the quads to relax and the other tells the hamstrings to contract, returning the calf to its resting position. DTR's oppose stretch reflexes and are used diagnostically to determine how a part of a person's neurological health is doing.

This next graphic shows a rather confounding look at the crossed extensor/flexor mixed reflex:



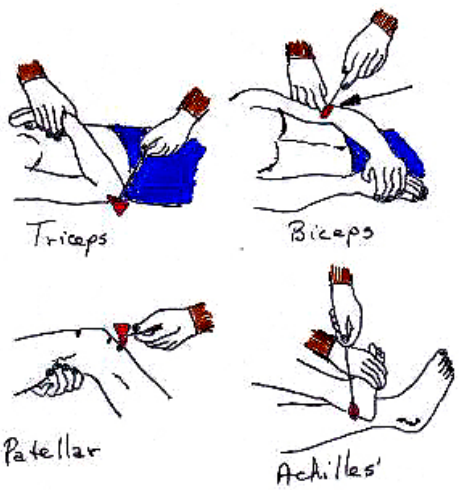
I like to call this one the "step-on-a-tack" reflex, because it's exactly what happens throughout the cord when you step on a tack. It goes like this: 1) you step on a tack, 2) sensory stimulus is sent to the cord and distributed 3) to multiple regions of the cord. Output is sent to the side where the pain is felt AND to the opposite side. This causes, 1) the side not injured to extend and 2) the side injured to flex off the tack, 3) effecting a hop -- like we all do when we step on a tack. Notice, too, that signals go up and down the cord to different levels to effect the necessary movements to make a "hop" on the side opposite the injury.

Tabulated, below, is a non-inclusive summary of reflexes used in clinical examinations.

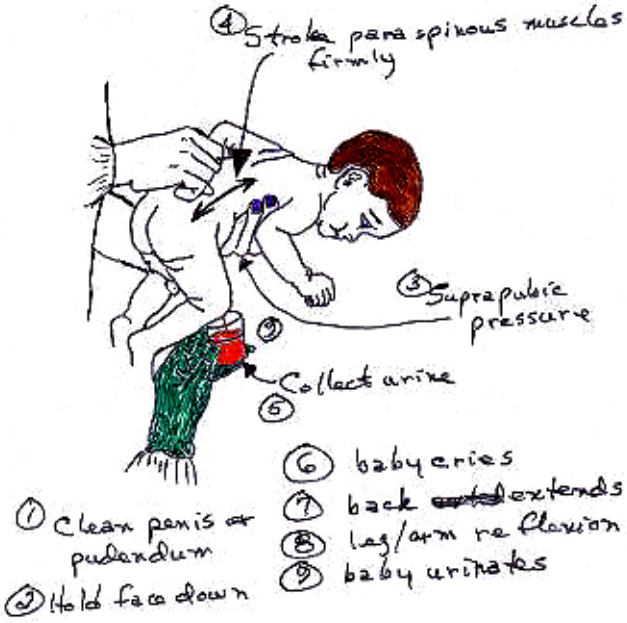
Reflex	Description	Reflex	Description
Achilles' tendon reflex	Percuss the Achilles' tendon: foot plantar flexes; exaggerated with upper motor neuron damage; decreased or absent with lower motor neuron damage, aka ankle jerk	Knee jerk (patellar)	Percuss the patellar ligament: lower leg extends; with lower motor neuron damage: diminished/abolished reflex; upper motor damage: muscle tone/response greatly increased, this is pathological
Babinski's reflex	Dorsiflexion of toe #1 following lateral to medial stroking of the sole (normal); if toe extends and outer toes flare, this is positive for pyramidal tract lesions; present in infants < 6months of age	Light	Pupil constricts with light shone on it
Biceps	Percuss biceps brachii insertion tendon: forearm flexes	Moro startle reflex	Blow in face, on top of abdomen: infant responds with rapid abduction/extension of arms with adduction embracing/hugging) of arms; disappears after 1-2 months of age; if absent or unilateral, may suggest brain damage or a birth-originated injury
Ciliospinal	Stroke/scratch/pinch the skin of the back of the neck and see pupillary dilation	Pilomotor	Goose flesh due to skin cooling rapidly or after emotional reaction

Reflex	Description	Reflex	Description
Corneal	Eyelids close due to corneal irritation	Red light	Reflected red light on ophthalmological exam (photos, too); generally indicates a lack of cataracts
Cremasteric	Stroke the front of the inner thigh -- causes testicular retraction	Rooting	Stroke cheek: mouth moves to stimulus; present at birth; gone by 4 months of age if awake when tested; by 7 months of age if asleep when tested
Triceps	Percuss the triceps insertion tendon and it causes forearm extension (sort of) while arm is held loosely in bent position	Babinski's SIGN	Decreased or absent Achilles' tendon reflex in sciatica
Palmar grasp	Lightly stroke the palm: grasps at stimulus; present at birth, bone by 6 months of age		

The following illustrations demonstrate the techniques for performing 4 of the tendon reflexes discussed above:



The last graphic, below, illustrates a non-traditional reflex. This is the Perez reflex:



It is used when one wishes to get urine from a baby. 1) Clean the penis or pudendum, 2) hold the baby face down applying suprapubic pressure, 3) stroke the paraspinous (muscles along the spine) muscles firmly and 4) hold urine container beneath the genitals. 5) baby cries, 6) the back extends, 7) legs/arms reflection occurs and 8) baby urinates.

In this laboratory experiment, you will learn how to perform the following reflexes:

Achilles' tendon reflex (ankle jerk)	Babinski's reflex
Biceps reflex	Ciliospinal reflex
Triceps reflex	Patellar reflex
Light reflex	

Experimental: Supplies

Obtain a reflex hammer and a lab partner. Find a quiet place to perform this experiment – the classroom is better than the lab as the inherent dangers in the lab aren't in the classroom.

Experimental: Methods

The following two tables summarize the techniques for these reflexes:

Reflex	Technique
Achilles' tendon reflex	Percuss the Achilles' tendon: foot plantar flexes. This reflex is exaggerated with upper motor neuron damage. It is also known as the ankle jerk. It is performed by having your subject stand on the foot NOT to be tested and resting the other foot (shin, more precisely) on a bench or stool. The examiner strikes the Achilles' tendon with the reflex hammer after the examiner has caused the foot to be slightly dorsiflexed. The tendon "jumps" and so does the foot in the case of the normal response.
Babinski's reflex	This reflex is elicited by stroking the sole of the foot from lateral to medial with the handle of the reflex hammer. Dorsiflexion of the great toe (toe #1) is considered normal. If the toe extends (plantar flexes) and the outer toes flare, this is positive for pyramidal tract lesions. This reflex is present in infants < 6 MOA. This reflex is of necessity performed on bare feet. Perform this reflex test in the class room or somewhere outside the lab.
Patellar reflex	Is also known as the knee jerk reflex. Percuss the patellar ligament as the patient is sitting on the edge of a bench (remember to clean the lab bench thoroughly if you choose to use it!) table or chair that is high enough to keep the foot off the ground. Positive results are that the lower leg extends rapidly. In the case of lower motor neuron damage, the reflex is diminished.abolished; in upper motor neuron damage, the reflex there is greatly increased muscle tone and response (exaggerated). This latter finding is a pathological reflex.
Ciliospinal reflex	Stroke/scratch/pinch – you work this out with your lab partner – the skin of the back of the neck and observe the pupils for dilation – this reflex takes two to do.
Light reflex	Shine a light in your partner's eyes. Observe the pupils for contraction; after the light is off, observe the pupils for dilation. An alternative technique is to have your partner cover the eye not being tested, shine the light in the other eye and make the same observations. Have your partner, then, uncover both eyes while you shine a light in ONE eye – watch the other pupil constrict, as well.

Reflex	Technique
Triceps reflex	Percuss the triceps tendon. A positive response is that the forearm extends while the examiner holds the arm loosely in a bent position. To perform this test, the examiner stands next to the examinee, holding the examinee's upper arm in his or her hand – sling-like. The examiner then strikes the triceps tendon and observes the examinee's arm for extension of the forearm. Sometimes you may only see a "twitch" of the tendon after striking.
Biceps reflex	The idea here is to percuss the biceps insertion tendon and observe for forearm flexion. The technique is a bit different from the other reflexes. The examiner needs to grasp the examinee's arm in such a manner that his or her thumb rests on the biceps insertion tendon. The examiner strikes his or her OWN thumb (nail is best) with the pointed end of the reflex hammer. As it may be difficult to observe forearm flexion, the observer feels for and looks for a twitching in the area struck under and around the examiner's thumb.

Sometimes people over-ride their reflexes by concentrating on not having a response. This is time consuming for the health-care practitioner and frustrating for the novice. To get around this problem, if you feel it is happening, have your partner put his or her hands together, fingers interlocked. Before you test the reflex, have him or her pull as hard as s/he can WITHOUT letting go of his or her hands. THEN check the reflex.

If the previous idea doesn't work, or if it gets in the way, have the patient/subject/examinee do his or her times tables out loud, then repeat above. Make certain that the times tables the examinee is doing are difficult enough so that they are focusing on the multiplication task, rather than what you are doing to them.

Record your results/observations in the table, below:

Reflex	Results
Achilles' tendon reflex	
Babinski's reflex	
Patellar reflex	
Ciliospinal reflex	
Light reflex	
Biceps reflex	
Triceps reflex	