



## Neurological Examination

### Motor Examination

**OBJECTIVE:** To conduct a complete Motor Examination as a part of Neurological Examination.

**MATERIALS:** Well illuminated examination room, examination table, clean gloves, reflex hammer and tuning fork.

*D: Appropriately done PD: Partially done ND: Not done/Incorrectly done*

STEP/TASK	D	PD	ND
<b>Preparation</b>			
1. Introduce yourself to the patient.			
2. Confirm patient's ID.			
3. Explain the procedure and reassure the patient.			
4. Get patient's consent.			
5. Wash hands.			
6. Prepare the necessary materials.			
7. Show the patient each object and allow him/her to touch them prior to beginning the exam to reduce any fear of being hurt during the examination.			
8. Position the patient in a lying or sitting position and uncover arms and legs.			
<b>Examination</b>			
<b>Inspection</b>			
9. Look for posture of the body ( <i>e.g. deformities, asymmetry, abnormal posture</i> ).			
10. Look for abnormal movements ( <i>e.g. tremor, fasciculation, dystonia, athetosis</i> ).			
11. Look for muscle bulk of the body and compare both sides.			
<b>Muscle Tone</b>			
12. Test the tone in the upper limbs by holding the patient's hand and simultaneously pronating and supinating and flexing and extending the forearm.			
13. Test the tone in the legs by rolling the leg on the bed, by flexing and extending the knee, or by abruptly lifting the leg at the knee.			
<b>Power</b>			
14. Test muscle strength for shoulder abduction elbow flexion and extension. Wrist flexion and extension, finger flexion, extension, abduction and adduction, and thumb abduction and opposition. Compare muscle strength on both sides, and grade it on the muscle strength scale*.			
15. Test muscle strength for hip flexion, extension, abduction and adduction, knee flexion and extension, plantar flexion and dorsiflexion of the foot and big toe, and inversion and eversion of the forefoot. Compare muscles strength on both sides, and grade it on the muscle strength scale*.			
➔ <i>Continues on the next page</i>			

<b>Neurological Examination: Motor Examination</b>				
<b>STEP/TASK</b>	<b>D</b>	<b>PD</b>	<b>ND</b>	
<b>Examination</b>				
<b>Reflexes</b>				
16.	Test biceps, supinator, and triceps reflexes with a reflex hammer. <i>(Compare both sides. If a reflex cannot be elicited retest with reinforcement).</i>			
17.	Test the knee jerk and ankle jerk with a reflex hammer. <i>(Compare both sides. If a reflex cannot be elicited retest with reinforcement).</i>			
18.	Test for clonus by holding up the ankle and rapidly dorsiflexing the foot.			
19.	Test for the Babinsky sign ( <i>extensor plantar reflex</i> ) using the sharp end of a reflex hammer.			
<b>Co-ordination</b>				
20.	<b>Resting tremor:</b> • Ask the patient to rest his hands in his lap and to close his eyes.			
21.	<b>Test for Intention tremor:</b> • Ask the patient to do something ( <i>e.g. remove his watch or write a sentence</i> ).			
22.	<b>Fine finger movements:</b> • Ask the patient to oppose his thumb with each of his other fingers in turn. Once he is able to do this, ask him to do it as fast as he can, remember that he has two hands.			
23.	<b>Finger to-nose test</b> carry out to test dysynergia and dysmetria: • Place your index finger at about two feet from the patient's face. Ask him to touch the tip of his nose and then the tip of your finger with the tip of his index finger. • Do the test bilaterally.			
24.	<b>Test for dysdiadochokinesis:</b> • Ask the patient to clap and then show him how to clap by alternating the palmar and dorsal surfaces of one hand. Once he is able to do this, ask him to do it as fast as he can. Ask him to repeat the test with his other hand.			
25.	<b>Heel to-shin test:</b> • Lie the patient down. Ask him to run the heel of one leg down the shin of the other, and then to bring the heel back up to the knee and to start again. • Ask him to repeat the test with his other leg.			
<b>Gait examination</b> ( <i>Always be in a position to steady the patient should he threaten to fall</i> ).				
26.	<b>Inspection:</b> • Ask the patient to stand up. Ensure that he is steady on his feet and inspect his posture from both front and side.			
27.	<b>Gait and arm swing:</b> • Ask the patient to walk to the end of the room and to turn around and walk back. <b>Heel-to-toe test:</b> Ask the patient to walk (as if on a tightrope): heel-to-toe, then on their toes only, and finally on their heels only.			
28.	<b>Romberg's test:</b> Ask him to stand unaided with his arms by his sides and with his eyes closed. <i>(If the patient sways or loses balance then this test is positive)</i>			
<b>After the examination</b>				
29.	Ensure that the patient is comfortable.			
30.	Make explanations to the patient, answer his/her questions and discuss management plan.			
31.	Dispose of sharps and waste material according to infection control standards.			
32.	Wash hands.			
33.	Document the procedure.			

## Muscle Strength Scale\*

Major skeletal muscles can be functionally assessed for their strength. Muscles are evaluated individually with comparison to that of the same muscle on the opposite side of the body. Muscle strength can be monitored over time to follow progression or remission of disease.

Findings	Grade
Normal motor power.	5
Able to overcome gravity and significant resistance but strength not quite normal.	4++
Able to overcome gravity and moderate resistance.	4+
Able to overcome gravity and mild resistance.	4
Able to overcome gravity but not resistance.	3
Unable to overcome the force of gravity but able to move in the plane of the supported extremity.	2
Flicker movements only.	1
Total paralysis (NO movement).	0

\* Miller DW Hahn JF. Chapter 1: General methods of clinical examination. pags 31-32. IN: Youmans JR. Neurological Surgery 4 edition. W.B. Saunders Company. 1996.

## Muscle Actions and Innervations\*

Upper Extremity			
Action	Muscle(s)	Nerve(s)	Nerve Roots
Arm abduction	Deltoid	Axillary	C5, C6
Elbow flexion	Biceps	Musculocutaneous	C5, C6
Elbow extension	Triceps	Radial	C6, C7, C8
Extension at the wrist	Forearm extensors	Radial	C6, C7, C8
Flexion of the wrist	Forearm flexors	Median & ulnar nerves	C6, C7, C8, T1
Wrist abduction	Flexor carpi radialis	Median	C6, C7
Finger extension	Extensor digitorum	Posterior interosseous	C7, C8
Finger flexion	flexor digitorum superficialis and flexor digitorum profundus (FDP)	median, anterior interosseous (FDP I & II), & ulnar (FDP III & IV)	C7, C8, T1
Abduction of index finger	First dorsal interosseous	Ulnar	C8, T1
Abduction of little finger	Abductor digiti minimi	Ulnar	C8, T1
Thumb abduction	Abductor pollicis brevis	Median	C8, T1
Thumb adduction	Adductor pollicis	Ulnar	C8, T1
Thumb extension	Extensor pollicis longus	Posterior interosseous	C7, C8
Lower Extremity			
Action	Muscle	Nerve	Nerve Roots
Hip flexion	Iliopsoas	Femoral	L1, L2, L3
Hip extension	Gluteus maximus	Inferior gluteal	L5, S1, S2
Hip abduction	Gluteus medius, minimus & tensor fasciae latae	Superior gluteal	L4, L5, S1
Hip adduction	Adductors	Obturator	L2, L3, L4,
Knee extensors	Quadriceps femoris	Femoral	L2, L3, L4
Knee flexion	Hamstring	Sciatic	L5, S1, S2
Ankle dorsiflexion	Tibialis anterior	Deep peroneal	L4, L5
Ankle plantar flexion	Gastrocnemius & soleus	Tibial	S1, S2
Toe extension <sup>+</sup>	Lower leg extensors (extensor digitorum longus, extensor digitorum brevis, extensor hallucis longus [to the big toe])	Deep peroneal	L5, S1
Toe flexion	Flexor digitorum longus, flexor hallucis longus	Tibial	L5, S1, S2
Foot eversion	Peroneus longus & brevis	Superficial peroneal	L5, S1
Foot inversion	Tibialis posterior	Tibial	L4, L5

<sup>+</sup> The muscles are called extensors, the action is also sometimes described as toe dorsiflexion. (Curling of toes is called plantarflexion).

In the accompanying videotape since the muscles are extensors, I describe the action as extension of the toe.

*\*The Neurological Exam, Faculty of Medicine, University of Toronto, Canada.*

Available from: [http://www.utoronto.ca/neuronotes/NeuroExam/MRC\\_scale.htm](http://www.utoronto.ca/neuronotes/NeuroExam/MRC_scale.htm).