

**JoVE: Science Education**  
**Introduction to the Neurological Examination**  
--Manuscript Draft--

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**Overview**

The neurological examination is usually presented in the same order no matter where in the world. It includes taking the patient’s history, a mental status examination, an examination of cranial nerves, and motor and sensory evaluation. As the nervous system is symmetric, the clinician compares the patient’s two sides during the examination, looking for any asymmetries. These clues may help distinguish actual from feigned disease.

Although these videos do not cover the history-taking part of the examination, the history is often how the diagnosis is made, either by what the patient is describing or how the information is being presented. Most neurological diagnoses are made by the history, and the examination helps to confirm the clinical impressions. There are not always adequate words in the English language to describe many of the sensations that patients with neurological complaints may have. For example, two different patients may mean entirely different things when they say they are dizzy. One may have vertigo from benign paroxysmal positional vertigo, a disorder of the inner ear, but the other may be using the word “dizzy” to describe an aura prior to a seizure. A patient may insist there is nothing wrong at all, and that their relative made the appointment for them. The vague complaints and poor judgment may help tailor this exam to spend more time testing mental status to confirm dementia.

This video provides an overview and an explanation of each part of the examination, followed by a demonstration of the tools needed to complete the exam.

**Procedure**

1. Parts of the neurological examination (excluding the patient’s history, which is the first step of the evaluation).

1.1 The mental status examination includes the perceptions and observations of the patient, as well as possible formal cognitive testing.

1.1.1 Perform an informal evaluation of the patient’s mental status and note their appearance, behavior, mood, thought process, speech, language, and cognitive assessment.

1.1.2 Proceed to administer a formal cognitive test, if there is an indication of cognitive impairment.

**Comment [AS1]:** The premise of this manuscript is to list parts of the neurological exam and to introduce the tools that are used during it. This concept is largely inspired by Moshe - as he said on multiple occasions, it would be useful to go back to the basics and have, "This is a stethoscope" said in a video. It has also never been done before in any video course, and I believe it will set our project apart from the existing resources. The way that the author envisions the video is listing parts of the neurological exam, illustrated by short video clips – perhaps from the videos from the same module and demonstrating the equipment, providing, in a few cases, short comments on how to use them.

**Comment [AS2]:** Dr. Brown had written this part as a narrative in her rough draft. See below:

The series of videos that follow this introduction will each demonstrate how to complete a different part of neurological examination. The neurological examination is usually presented in the same order no matter where in the country or world.

- PARTS OF THE NEUROLOGICAL EXAMINATION:
- 1. HISTORY
  - 2. MENTAL STATUS - Includes perceptions and observations of the patient as well as possible formal cognitive testing.
  - 3. CRANIAL NERVES - Testing does not usually include testing of cranial nerve I (olfaction) but testing of cranial nerves II-XII should proceed in an organized manner, examining the nerves in numerical order.
  - 4. MOTOR EXAM – Includes observation of gait, muscle tone, and testing of muscle strength, reflexes, and coordination.
  - 5. RELEXES – Includes muscle stretch reflexes as well as pathological reflexes.
  - 6. COORDINATION – Tests cerebellar functioning.
  - 7. SENSORY EXAM – Includes testing for both cortical (mostly parietal lobe function) and peripheral sensation.

**Comment [AS3]:** Here, short video clips from the other videos from the module can be used to illustrate each sentence.

## 1.2 Cranial nerves.

1.2.1 Perform the testing of the cranial nerves II-XII. The testing should proceed in an organized manner, examining the nerves in numerical order. Testing does not usually include the testing of cranial nerve I (olfaction).

## 1.3 Motor exam.

1.3.1 Perform an observation of gait; an evaluation of muscle tone and muscle strength; test the muscle stretch reflexes and pathological reflexes; and conduct the coordination assessment.

## 1.4 Sensory exam.

1.4.1 Perform testing for both cortical (mostly parietal lobe function) and peripheral sensation.

## 2. Tools and equipment needed for neurological examination.

The most important tool needed throughout all the sections of the examination is the examiner's skills of observation.

### 2.1 Mental status exam:

- Paper and pencil, if writing test or clock-drawing test are performed.
- Printed test, if the formal cognitive testing, such as mini-mental status exam (MMSE), is administered.

### 2.2 Cranial nerve exam:

- Scented test material, if olfaction is to be tested.
- Reading material, for testing visual acuity. Handheld card is best, which also usually has examples of pupillary sizes for reference.
- Ophthalmoscope, for fundoscopic examination.
- Otoscope, for specific circumstances (Bell's palsy or comatose patients).
- Flashlight, for testing pupillary responses.
- Q-tips or tissues, for testing corneal reflexes. Can also be used to test gag reflex.
- Tuning fork 256 Hertz (Hz), for testing hearing.
- Sugar/salt, for testing taste. Should be converted to solution and applied to tongue with Q-tip.
- Tongue blades, for checking gag reflex.

### 2.3 Motor exam:

- Reflex hammer, for testing reflexes and checking nerve sensitivity, such as Tinel's sign for carpal tunnel.

2.3.1 A reflex hammer should be well balanced, so the stimulus is the same each time reflexes are checked. The hammer should fall, rather than be used to hit the patient. Having soft rubber is helpful for patient comfort and may be best for the examiner's comfort, as well. Examiner should place their fingers on the patient's tendon or muscle and strike their own fingers, so the reflex can be both felt and seen.

**Comment [AS4]:** At this point different kinds of reflex hammers, and the technique can be demonstrated.

#### 2.4 Sensory exam:

- Coins or other small objects, for testing cortical sensory loss. Placed in patient's hand for correct identification.
- Safety pins, for testing sensory examination.
- Tuning fork 256 Hz, for testing vibratory sensation.

##### 2.4.1 Tips for using safety pins:

- Use pins to examine for sensory level across trunk, for establishing a pattern of dermatomal nerve root loss, or for distal loss, such as peripheral neuropathy.
- Use pin gently, but with equal pressure.
- Be especially gentle in elderly patients who may have fragile skin. Should be disposed of in sharps container after each use.

#### 2.5 Miscellaneous tests and equipment:

- Stethoscope, for assessing carotid bruits by auscultation.
- Optokinetic nystagmus (OKN) tape, for demonstrating objective evidence of parietal lobe dysfunction. Have patient try to count the black stripes as the examiner moves the tape.
- Measuring tape, for checking differences between sides or measuring muscles to compare atrophied size.

## Summary

The neurological exam is like a dance staged in multiple acts. Each part of the exam has its own rhythm and logic, and the examination is fundamentally based on applied neuroanatomy. Improvisation is part of the testing, as each examination is adjusted as new information is gathered and as observation of the patient during the history and the early part of the examination uncovers unexpected information. Each section of the neurological examination adds to the information gathering and helps the clinician draw conclusions regarding the patient's health status.

Many clinicians are somewhat afraid of the field of neurology and consider it a black box, but it is elegant in its logic and its application of prior learned information. The neuroanatomy memorized by so many students, only to be forgotten later, actually comes into play during the

exam and transforms those previously forgotten nervous system textbook diagrams into a three-dimensional walking and talking patient.

It is often thought that it is no longer necessary to do an examination as complex as the neurological exam. There is the perception that neuroimaging has supplanted the neurological examination. The magnetic resonance imaging (MRI), or computerized tomography (CT), is part of the battery of information gathered to make diagnoses, but not all clinical entities are confirmed by imaging. Parkinson's disease is an example of a clinical diagnosis without any confirmatory testing (except for instances of familial genetic Parkinson's disease). At the other end of the spectrum, the MRI may make the diagnosis of multiple sclerosis (MS), but the clinical exam is needed to follow the exacerbations of the illness or to check for progressive disease. The MRI picture does not necessarily correlate with what is happening clinically in MS.

The examination should be adjusted to each patient based on clinical impressions after taking a history from them and reviewing their records. Examinations are different on a 20-year-old woman complaining of headaches than on an 83-year-old man who has been getting lost when driving.