

## The Practical Neurological Examination, Part 3

### ASSESSMENT OF COORDINATION

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Coordination deals with the ability to move in a smooth manner and the capability to perform alternating movements. Coordination relies on proper function of multiple aspects of the nervous system, including proprioceptive, motor, sensory, extrapyramidal, vestibular and - most importantly - cerebellar function.

As with [mental status](#) and [cranial nerves](#) (the first two of the six neurological components in this series), the observation component of the examination cannot be overstated. Coordination is relatively easy to test and dysfunction can be easily identified by observation, especially if a lesion is significant.

#### Daily Activity Clues

Since multiple aspects of the nervous system contribute to coordination, dysfunction can be identified during a variety of daily activities. If a patient presents with a wide stance or walks with the feet farther apart than normal, cerebellar dysfunction may be present (although other neurological functions may also be contributors). A broad-based gait is termed *ataxia* or *dystaxia*.

*Dysarthria*, or the slurring of speech, can be the result of a deficit in coordination. Since this sign is frequently associated with stroke, the patient should be evaluated for other signs of stroke and be assessed for abnormal coordination utilizing the tests described below.

Judging distances is often difficult with cerebellar-coordination abnormalities and dysfunction. This is evident when the patient reaches for an object. The patient may fall short of the object or overshoot the object.

The inability to perform movements that are rapid and alternating (clapping or toe tapping) in a smooth, coordinated manner is another sign of cerebellar-coordination problems. When rapid alternating movements are not possible, the condition is *dysdiadochokinesia*.

Movements that are described as "ratchet like," "jerky" or "choppy" are also common in cerebellar and coordination dysfunction. Normal movement is smooth. When one considers the essence of the signs detailed above, they can be summed up by saying that all movements should be repeatable, deliberate, smooth and on target.

While any of these signs may be readily observed, their absence does not guarantee the absence of coordination problems. Testing is necessary to confirm the absence or discover subtle findings that indicate dysfunction.

#### Testing Recommendations

There are several testing recommendations: finger to nose, finger to finger, heel to shin, rapid

alternating movement testing and Romberg's test. The *finger-to-nose test* is probably the most familiar of the coordination tests. It is performed by the patient extending the arms laterally and attempting to alternately touch the nose with the index fingers. The patient's eyes are closed.

While it is important that the patient find and touch the nose, it is as important - if not more so - that the patient is able to perform the task quickly, smoothly and repeatedly. This is a factor missed by many examiners, as the tendency is to have the patient touch the nose only once with each index finger. The inability to touch the nose in a repeated, smooth manner is a sign of an abnormal test and cerebellar-coordination dysfunction.

The *finger-to-finger test* evaluates coordination and is intended to help identify a patient who is having trouble judging distances due to a disturbance of coordination. The patient is instructed to touch their nose with their index finger and then touch the examiner's finger. The examiner's finger is held up in front of the patient 18 to 20 inches away. This is done repeatedly with the examiner moving their finger between touches. Unlike the finger-to-nose test, the finger-to-finger test is performed with the patient's eyes open.

The examiner moves their finger between touches to prevent the patient from finding the target from memory. If the patient cannot touch the finger repeatedly, falls short of touching the finger or overshoots and misses the finger, the test is positive for cerebellar-coordination dysfunction.

The *heel-to-shin test* is a good test for coordination problems affecting the lower extremities. The patient (seated or supine) is instructed to place the heel of one foot against the lower shin of the opposite leg. The patient is then instructed to slide the heel up and down the shin repeatedly. As with all of the other cerebellar-coordination tests, the action should be quick and smooth. The heel should remain in contact with the shin throughout the test. The test is abnormal if the patient's movements do not meet these criteria.

*Rapid alternating movements* can be assessed by clapping, alternating pronation and supination of the hands, drumming the fingers, alternate patting of the hands on the thighs and/or tapping the toes. Abnormal findings would fail to meet the normal requirements that movements be repeatable, deliberate, smooth and on target.

*Romberg's test* is a standard test of [coordination](#), but it is not very specific. It can help to identify whether a problem exists, but it can be difficult to determine where the lesion resides. Posterior-column, vestibular, cerebellar and other problems can contribute to abnormal findings. Posterior-column disease is considered to be the most likely.

The test is performed by having the standing patient place their feet close together, first with the eyes open and then with the eyes closed. The abnormal finding occurs when the patient loses their balance and/or begins to fall. The test is especially positive if the patient's loss of balance is sudden with the closing of the eyes. A mild degree of swaying is not abnormal, even in the normal patient.

The examinations recommended here should be more than enough to determine the existence of coordination abnormalities. Once identified, further testing to determine the location and exact nature of the lesion or disease is warranted.

*Resources*

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  - Gerraint F. *Neurological Examination Made Easy, 3<sup>rd</sup> Edition*. Churchill Livingstone, Edinburgh, 2004.
  - Goldberg S. *The Four Minute Neurological Exam*. MedMaster, Miami, FL, 2004.
  - Ferezy JS. *Chiropractic Neurological Examination*. Aspen Publications: Gaithersburg, MD, 1992.
  - DeMyer WE. *Techniques of the Neurological Examination, 4<sup>th</sup> Edition*. McGraw-Hill, Inc., New York, 1994.
  - Jones HR. *Netter's Neurology*. Saunders-Elsevier, Philadelphia, 2005
  - Fuller G. *Neurological Examination Made Easy, 3<sup>rd</sup> Edition*. Churchill Livingstone: Edinburgh, 2004.
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This article is the third of six written to provide practical knowledge and examples of how to incorporate all six components of the neurological assessment into a standard examination in an efficient and productive manner. [Part 1](#) of this series appeared in the Feb. 12, 2011 issue; [part 2](#) appeared in the April 9 issue.

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