TEST

Nerve conduction velocity

A nerve conduction velocity test measures how quickly electrical signals travel through nerves in your arms or legs.

WHAT IT MEASURES
Speed and strength of electrical signals through peripheral nerves

SAMPLE
None; surface electrodes record electrical nerve signals

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually 30 to 60 minutes

RESULTS IN
Usually days; timing varies by laboratory and clinic

USED FOR
Diagnosis and monitoring of peripheral nerve disorders

MAIN LIMITATION
Misses disorders affecting only small nerve fibres

Overview

Nerve conduction velocity, or NCV, measures how quickly an electrical signal travels along a nerve. It is usually measured as part of a nerve conduction study, often shortened to NCS.

During the test, small electrodes are placed on your skin. One electrode gives a brief electrical pulse to a nerve. Other electrodes record when the signal arrives and how strong the response is. The speed is calculated from the distance travelled and the time taken.

The test examines peripheral nerves. These carry signals between your brain or spinal cord and the rest of your body. Some control muscles, while others carry sensations such as touch.

An NCV test is often performed with electromyography, or EMG. EMG uses a fine needle electrode to record electrical activity inside selected muscles. The two tests provide different information and are not interchangeable.

Why the test is ordered

The test helps show whether symptoms may be related to damage or pressure affecting a peripheral nerve. It can also help locate the affected part of a nerve and describe the general pattern of damage.

It may be ordered to investigate:

The pattern can sometimes help distinguish loss of nerve fibres from damage to myelin. Myelin is the insulating covering that helps electrical signals travel quickly.

NCV results do not usually identify the underlying cause by themselves. Blood tests, imaging, examination findings, or other nerve tests may still be needed.

- Numbness, tingling, burning, or reduced sensation
- Muscle weakness or unexplained muscle wasting
- Suspected nerve compression, such as carpal tunnel syndrome
- Symptoms affecting several nerves, called polyneuropathy
- An injury involving a nerve
- Whether a known nerve disorder is changing over time

Who should have the test

There is no routine NCV screening programme for people without symptoms. The test is generally used when your symptoms and examination suggest a problem involving peripheral nerves.

It may be useful if the result could help confirm where a nerve is affected, separate one type of nerve problem from another, or guide further testing.

NCV is not the best test for every type of numbness or weakness. Problems in the brain or spinal cord may require imaging. Disorders affecting only very small sensory nerve fibres can produce burning pain despite normal nerve conduction results.

Children and pregnant people can have the test when clinically needed. The laboratory may adapt the procedure and interpretation for age, body size, pregnancy-related swelling, and the nerves being examined.

How to prepare

You can usually eat and drink normally. Fasting is not required unless another test planned for the same visit has separate instructions.

On the day of the appointment:

Usually, you should continue your regular medicines unless the testing service gives different instructions. Tell the service if you have a pacemaker, implanted defibrillator, or another electrical medical device.

Also mention blood-thinning medicines, a bleeding disorder, or significant lymphoedema. These issues matter mainly if needle EMG is planned in addition to the surface nerve conduction test.

- Do not put lotion, oil, or cream on the limbs being tested
- Wear loose clothing that allows access to your arms or legs
- Keep your hands and feet warm
- Bring a current list of medicines and supplements

What happens during the test

You will usually sit or lie on an examination couch. The clinician cleans the skin and places recording electrodes over a nerve or muscle.

A stimulating electrode gives a brief electrical pulse. You may feel a quick tapping, tingling, or muscle twitch. Several pulses may be used at different points along the nerve. Although the sensation can be uncomfortable, each pulse lasts only a short time.

The clinician measures how long the response takes, its size, and how it changes between testing points. Several nerves may be examined, including nerves on both sides for comparison.

If EMG is also needed, a fine needle electrode is inserted into selected muscles. This is a separate part of the appointment. You can ask which parts of the test are planned before it begins.

Understanding your results

Your report may include several measurements rather than one overall NCV number.

Conduction velocity is the speed of the signal along a section of nerve. Marked slowing can occur when myelin is damaged or when a nerve is compressed at a particular site.

Latency is the delay between stimulation and the recorded response. A longer delay may indicate slowing, but it must be interpreted for the specific nerve and distance tested.

Amplitude is the size of the recorded response. A smaller response can suggest that fewer nerve fibres are working, although technical factors can also reduce it.

Conduction block means that part of the signal does not pass normally through a section of nerve. This pattern has several possible explanations and must be considered with the rest of the study.

There is no single normal NCV range for every nerve. Ranges and interpretation vary by laboratory, age, sex, pregnancy status, medicines, limb temperature, and clinical context. Height, the nerve tested, and the exact testing method also matter.

A result outside the laboratory range does not by itself establish a diagnosis. Likewise, a normal result does not rule out every nerve disorder.

What affects the results

Limb temperature is one of the most important influences. Cold nerves conduct more slowly and can make results appear abnormal. The testing team may warm your hand or foot before repeating a measurement.

Other influences include:

After some acute nerve injuries, the full electrical changes take time to develop. Testing too early can therefore underestimate the damage. A repeat study may be more informative if symptoms continue.

Pregnancy-related fluid retention can contribute to nerve compression, particularly at the wrist. Previous surgery, fractures, or longstanding swelling can also change local responses.

Most everyday medicines do not meaningfully alter nerve conduction speed. However, medicines and treatments that can affect nerves remain relevant to the overall interpretation, so provide an accurate list.

- Incorrect measurement of the distance between electrodes
- Electrode placement or poor contact with oily skin
- Swelling, thick tissue, or significant limb scarring
- Movement or electrical interference during recording
- Age, height, and normal differences between people
- The timing of testing after a recent nerve injury

Accuracy and limitations

Accuracy depends on the nerve disorder being investigated, the nerves selected, limb temperature, equipment, and the clinician's technique. There is no single percentage describing how often NCV is correct for every condition.

The test can miss a disorder when:

It can appear abnormal when no important nerve disease is present. Cold limbs, inaccurate distance measurements, poor electrode contact, normal age-related changes, or an unusual but harmless response can contribute to this.

NCV is often strongest when combined with the physical examination and needle EMG. Skin biopsy or specialised autonomic testing may be better for suspected small-fibre neuropathy. MRI may be more useful for structural problems involving the brain, spinal cord, or a nerve root. Ultrasound can sometimes show swelling or compression of a superficial nerve.

- Only small pain- and temperature-sensing fibres are affected
- A nerve injury is very recent
- The affected area is not included in the study
- Symptoms come from the brain, spinal cord, or another non-nerve cause
- Mild or intermittent compression has not produced measurable changes

Risks and complications

Surface nerve conduction testing does not break the skin. The electrical pulses may be briefly uncomfortable, and adhesive electrodes can occasionally irritate sensitive skin, but lasting complications are not expected.

Needle EMG, if performed during the same visit, can cause temporary muscle soreness or a small bruise. Significant bleeding or infection is uncommon. Tell the clinician beforehand about blood-thinning medicines, bleeding problems, or an implanted electrical device.

What happens next

You can usually return to normal activity immediately after a nerve conduction study. If you also had needle EMG, mild soreness may last for a short time.

A specialist may discuss an initial impression during the appointment, but the full report can take several days. The findings are interpreted alongside your symptoms, examination, and any

other tests.

Routine follow-up may involve observation, treatment for an identified cause, imaging, blood tests, or a repeat study after enough time has passed for nerve changes to become measurable.

Do not wait for a routine results appointment if you develop sudden one-sided weakness, facial drooping, or difficulty speaking; seek emergency help. Rapidly worsening weakness, trouble breathing or swallowing, new loss of bladder or bowel control, or numbness around the groin also needs urgent assessment.

Common questions

Can I drink coffee before the test?

Usually, yes. Coffee does not normally interfere with nerve conduction measurements. Follow any separate instructions if another procedure is scheduled at the same visit.

Does the time of day matter?

Usually not. Limb temperature and testing conditions matter more than the time of day.

Can I exercise beforehand?

Normal activity is generally fine. Avoid arriving with very cold limbs, and consider avoiding unusually strenuous exercise if it leaves your muscles sore, especially when needle EMG is also planned.

Does the electrical pulse hurt?

Most people describe a brief shock, tap, or twitch. It can be uncomfortable, but each pulse is short and the strength is adjusted to obtain a reliable response.

Can I drive home afterward?

Yes, in most cases. Sedation is not normally used, and the test should not affect your ability to drive.

Will a normal result rule out neuropathy?

No. The test mainly evaluates larger, myelinated nerve fibres. Small-fibre neuropathy and some early or mild nerve problems can produce normal results.

Sources

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