TEST

Pulmonary function tests

Pulmonary function tests measure how much air your lungs hold and move.

WHAT IT MEASURES
Lung airflow, volume, and gas transfer

SAMPLE
None; measurements are taken while you breathe

FASTING NEEDED?
No; avoid a large meal beforehand

HOW LONG IT TAKES
Usually 30 to 90 minutes

RESULTS IN
Same day to several days, depending on service

USED FOR
Diagnosis, treatment planning, and monitoring

MAIN LIMITATION
Results rely on correct technique and consistent effort

Overview

Pulmonary function tests, also called lung function tests, are a group of breathing tests. They measure how well air moves into and out of your lungs, how much air your lungs can hold, and how effectively oxygen passes into your blood.

The most common test is spirometry . You breathe forcefully into a mouthpiece connected to a machine. Other tests may measure total lung volume or gas transfer. Your appointment may include one test or several.

These tests can help identify a pattern of narrowed airways, reduced lung volume, or reduced gas transfer. They do not usually show the cause by themselves. Your symptoms, examination, medical history, and other tests remain important.

Why the test is ordered

Pulmonary function tests may be ordered to investigate symptoms such as ongoing breathlessness, wheezing, cough, or reduced ability to exercise.

They are also used to:

A result may also provide a baseline for comparison with future tests.

- Help assess conditions such as asthma or chronic obstructive pulmonary disease
- Check whether a lung condition is stable or changing
- Measure response to an inhaler or another treatment
- Assess breathing before certain operations
- Monitor medicines that can affect the lungs
- Evaluate possible workplace or environmental exposure

Who should have the test

You may be offered testing when your symptoms or medical history suggest that measuring lung function could guide your care. People with known lung disease may have repeat tests to monitor changes over time.

Testing is not necessary for everyone with brief or mild respiratory symptoms. It is most useful when the result is likely to affect diagnosis, treatment, surgery planning, or follow-up.

Tell the testing service before your appointment if you have recently had chest, abdominal, brain, or eye surgery; a recent heart problem; a collapsed lung; coughing of blood; or a contagious respiratory infection. These do not always prevent testing, but the team may need to change or postpone the procedure.

How to prepare

Follow the instructions from your testing service because preparation differs according to which tests are planned.

You may be asked to:

Do not stop an inhaler or other medicine unless the testing service has specifically told you to do so. Some inhalers need to be withheld before testing how your airways respond, but the timing differs by medicine and by the purpose of the test.

Tell the technician if you recently had a chest infection or a flare-up of breathing symptoms. Also mention pregnancy, supplemental oxygen use, smoking, anaemia, or a recent blood transfusion, as these can affect parts of the assessment.

- Avoid smoking or vaping shortly before the appointment
- Avoid vigorous exercise for at least an hour beforehand
- Avoid a large meal before testing
- Wear loose clothing that does not restrict your chest or abdomen
- Bring your inhalers and an up-to-date medicines list

What happens during the test

The technician will usually measure your height and weight and explain each breathing manoeuvre. You may wear a nose clip so that all air passes through the mouthpiece.

During spirometry, you normally take the deepest breath you can and then blow out as hard, fast, and completely as possible. You repeat this several times so the technician can check that the measurements are consistent.

You may then receive a medicine called a bronchodilator like albuterol or salmeterol , usually through an inhaler. This relaxes muscles around the airways. After waiting for it to work, you repeat spirometry to see whether airflow changes.

Other possible tests include:

You can pause between attempts. Tell the technician if you feel unwell, dizzy, or too breathless to continue.

- Lung volume testing: measures the total amount of air your lungs hold, sometimes while you sit inside a clear enclosed booth
- Gas transfer testing: measures how well a very small, safe amount of test gas moves from your lungs into your blood
- Challenge testing: measures whether your airways narrow after exercise or an inhaled substance, under close supervision

Understanding your results

Results are compared with expected values for someone with similar characteristics. Reference ranges and interpretation vary by laboratory, age, sex, height, pregnancy status, medicines, and clinical context. There is no single normal number for everyone.

Common measurements include:

A low FEV1/FVC ratio may show an obstructive pattern, meaning air has difficulty leaving the

lungs. This can occur in several conditions and does not identify one diagnosis by itself.

A low FVC may suggest reduced lung volume, but spirometry alone cannot confirm this. Total lung capacity is usually needed to confirm a restrictive pattern.

Gas transfer may be reduced for several reasons, including changes in lung tissue, blood vessels, or haemoglobin. Haemoglobin is the oxygen-carrying protein in red blood cells. The result must be interpreted alongside other information.

- FEV1: how much air you force out in the first second
- FVC: the total amount you force out after a full breath in
- FEV1/FVC ratio: the proportion exhaled during the first second
- Total lung capacity: the total air held after the deepest possible breath
- Gas transfer, often called DLCO: how effectively gas passes from the lungs into the blood

What affects the results

Technique and effort have a major effect. An incomplete breath in, a weak start, coughing, stopping too early, or air leaking around the mouthpiece can produce falsely low values. This is why the technician asks you to repeat the manoeuvre.

Recent inhaler use can improve airflow and may hide airway narrowing if the test was intended to measure your untreated breathing. Never withhold an essential medicine without specific instructions.

Other influences include:

Gas transfer results are affected by haemoglobin levels. Anaemia can make gas transfer appear lower. A recent transfusion can change haemoglobin and may affect comparison with an earlier result. Smoking raises carbon monoxide in the blood and can also alter the measurement. Supplemental oxygen and some medicines may matter, so tell the laboratory about them.

- A recent respiratory infection or flare-up
- Smoking or vaping shortly before testing
- Vigorous recent exercise
- A large meal or tight clothing limiting a deep breath
- Pain, fatigue, or difficulty understanding the breathing instructions
- Incorrectly recorded height or use of an unsuitable reference equation

- Pregnancy, body position, and marked changes in body weight

Accuracy and limitations

When performed to accepted standards, pulmonary function tests provide reliable measurements of lung performance. Repeating the manoeuvres helps identify an accidental poor effort or air leak.

The tests can still miss a problem. For example, spirometry may be normal between asthma episodes or when disease is mild. Using an inhaler before testing may also make airway narrowing less obvious.

The tests can also suggest a problem that is not present. Poor effort may falsely lower FVC and resemble restricted lung volume. An inadequate mouth seal or stopping early can lower several measurements.

A bronchodilator response can support evidence of reversible airway narrowing, but it does not confirm asthma on its own. A limited response does not rule asthma out.

Different tests answer different questions. Full lung volume testing is better than spirometry alone for confirming restriction. A supervised airway challenge may be useful when asthma is still suspected despite normal spirometry. Chest imaging shows lung structure, while exercise testing can investigate breathlessness that occurs mainly during activity.

Risks and complications

Routine pulmonary function testing is generally low risk. Forceful breathing can briefly cause coughing, light-headedness, chest tightness, or breathlessness, and symptoms usually settle after resting.

A bronchodilator may temporarily cause shakiness, a faster heartbeat, or headache. Challenge tests can cause wheezing or chest tightness, so they are performed with monitoring and medicine available to reverse the effect.

What happens next

A respiratory specialist, laboratory clinician, or the professional who ordered the test will review the measurements and quality checks. They will interpret them alongside your symptoms, examination, medicines, smoking history, and previous results.

Routine follow-up may involve discussing inhaler treatment, repeating the test later, or arranging lung volume testing, imaging, blood tests, or an exercise assessment. A small change between tests does not always mean that your lungs have worsened; normal measurement variation and differences in technique can contribute.

Do not wait for a routine results appointment if you develop severe breathing difficulty, blue or grey lips, new confusion, fainting, or severe chest pain. Seek emergency medical help.

Common questions

Can I drink coffee before pulmonary function tests?

Coffee is usually allowed for routine spirometry. If you are having an exercise or airway challenge test, the service may ask you to avoid caffeine because it can affect the response. Follow your appointment instructions.

Can I eat before the test?

Yes, but avoid a large meal shortly beforehand. A very full stomach can make it harder to take a deep breath.

Does the time of day matter?

It usually does not matter for routine testing. For repeat monitoring, similar timing and medicine use can make comparisons more consistent.

Can I exercise beforehand?

Avoid vigorous exercise for at least an hour before testing unless your instructions say otherwise. Gentle everyday activity is generally acceptable.

Should I use my inhaler before the appointment?

Use it unless you have been clearly instructed to withhold it. Bring it with you and record when you last used it.

What if I cannot complete the breathing manoeuvre?

Tell the technician. They can demonstrate it again, allow a rest, and record any limitations. A result that does not meet quality checks may need to be repeated or interpreted cautiously.

Sources

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