TEST

Lung plethysmography

Lung plethysmography is a breathing test that measures lung volumes and airway resistance inside an enclosed booth.

WHAT IT MEASURES
Lung volumes and how easily air moves through the airways

SAMPLE
None; breathing measurements only

FASTING NEEDED?
No

HOW LONG IT TAKES
About 30 to 60 minutes

RESULTS IN
Usually same day; timing varies by laboratory

USED FOR
Diagnosis and monitoring of lung conditions

MAIN LIMITATION
Air leaks or incorrect panting can distort lung-volume estimates

Overview

Lung plethysmography is a type of pulmonary function test, also called a lung function test. It measures how much air your lungs hold at different points in a normal breath. It may also measure how much resistance air meets as it moves through your airways.

The test takes place inside a clear, airtight booth that looks similar to a telephone booth. You breathe through a mouthpiece while small pressure changes are measured. These measurements allow a computer to estimate the volume of gas in your chest.

Unlike some other lung-volume tests, plethysmography can measure air trapped behind narrowed or closed airways. This can be useful when investigating conditions that cause air trapping or overinflated lungs.

Lung plethysmography does not use radiation, needles, or a contrast dye. It is often performed with spirometry, which measures how much and how quickly you can blow air out.

Why the test is ordered

Your healthcare professional may order lung plethysmography to clarify a spirometry result or investigate breathing symptoms. It can help show whether your lungs hold too little or too much air.

Common reasons include:

The test contributes information but does not establish a diagnosis by itself. Your symptoms, examination, medical history, imaging, and other breathing tests may also be needed.

- Confirming whether the total amount of air in the lungs is reduced
- Looking for air trapping or unusually large lung volumes
- Measuring airway resistance
- Assessing conditions such as asthma, chronic obstructive pulmonary disease, or interstitial lung disease
- Monitoring changes in a known lung condition
- Assessing lung function before certain operations or treatments

Who should have the test

You may be offered this test when spirometry alone cannot explain your symptoms or results. For example, spirometry may suggest that your lungs are small, but measuring total lung capacity is needed to confirm this.

Plethysmography may also be useful if air trapping is suspected. It measures gas that remains in the chest even when that gas does not communicate well with the mouthpiece.

Not everyone with breathing symptoms needs lung plethysmography. Spirometry, oxygen measurements, a chest scan, or a gas-transfer test may be more appropriate for some questions.

Tell the testing team before your appointment if you have an acute chest infection, severe current breathlessness, chest pain, a recent collapsed lung, or recent chest, abdominal, eye, or brain surgery. 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 centre because preparation varies according to

which lung tests are planned.

You will usually be asked to:

You may be asked to pause certain inhalers before testing. The required interval differs by medicine and by whether the aim is to assess your usual treated breathing or your breathing without a bronchodilator. A bronchodilator like albuterol or salmeterol is a medicine that opens the airways. Do not stop prescribed medicines unless the testing team has given you clear instructions.

Tell the team if you use supplemental oxygen. Also mention if enclosed spaces make you anxious. Staff can explain how the booth opens and how you can communicate throughout the test.

- Avoid a large meal shortly before the test
- Avoid vigorous exercise for at least the period specified by the laboratory
- Avoid smoking or vaping before the appointment
- Wear loose clothing that does not restrict your chest or abdomen
- Bring a list of your inhalers and other medicines

What happens during the test

You sit inside the booth with the door closed. The walls are usually transparent, and you can see and hear the staff member. The door can be opened if you need to stop.

You wear a nose clip and seal your lips around a mouthpiece. The technician first asks you to breathe normally. You may then be asked to pant gently.

For part of the test, a shutter briefly blocks the mouthpiece while you continue making small breathing efforts. No air moves through the mouthpiece during these few seconds. Pressure changes at your mouth and inside the booth are used to calculate the amount of gas in your chest.

The shutter is opened promptly, and you may then take a full breath in or blow out completely. Several measurements are usually repeated to check that they agree. If airway resistance is being measured, you may perform additional gentle panting manoeuvres.

The full appointment often includes spirometry or other breathing tests and commonly lasts 30 to 60 minutes.

Understanding your results

Your report may include several measurements:

A low total lung capacity can support the presence of a restrictive pattern, meaning the lungs or chest cannot expand to the expected volume. A high residual volume or residual-volume ratio can suggest air trapping. A high total lung capacity may occur with lung overinflation.

These findings are not specific to one condition. For example, a reduced lung volume may reflect lung tissue disease, body size, muscle weakness, chest-wall factors, or incomplete effort.

Results are compared with predicted values calculated from reference populations. Expected values and interpretation vary by laboratory, age, sex, height, pregnancy status, medicines, reference equation, and clinical context. Your report may use a lower limit of normal or a statistical score rather than a single universal reference range.

- Total lung capacity: the greatest amount of air your lungs can hold
- Residual volume: the air left after you breathe out as fully as possible
- Functional residual capacity: the air remaining after a normal, relaxed breath out
- Residual volume to total lung capacity ratio: the proportion of lung volume that remains after full exhalation
- Airway resistance: how much the airways oppose airflow

What affects the results

Lung plethysmography relies on a tight mouth seal and correctly timed, gentle panting. Air leaking around the mouthpiece can make the calculated volume inaccurate. Panting too quickly may overestimate lung volume, especially when airflow is severely limited.

Other influences include:

Age, sex, and height affect expected lung volumes and are included in reference calculations. Incorrectly recorded height can therefore alter the interpretation.

The equipment also requires careful calibration for temperature and pressure. Quality checks and repeated measurements help identify technical problems.

- Closing the throat or placing the tongue over the mouthpiece
- Failing to support the cheeks as instructed
- Not breathing fully in or out when asked

- Coughing during a measurement
- Pain, fatigue, anxiety, or difficulty following the manoeuvres
- Recent vigorous exercise, smoking, vaping, or a large meal
- Bronchodilators and other medicines that change airway narrowing
- A recent respiratory infection or worsening of a lung condition
- Obesity, pregnancy, posture, and chest-wall shape

Accuracy and limitations

When performed correctly, plethysmography provides repeatable measurements of the gas within the chest. It is particularly useful for detecting trapped gas that helium-dilution or nitrogen-washout tests may miss because those methods measure gas that communicates with the airways.

Plethysmography can also give a falsely high result. This is more likely when someone with severe airway narrowing pants too fast or when pressure at the mouth does not accurately reflect pressure inside the chest.

Poor technique can produce an apparent abnormal result when lung volumes are normal. It can also hide an abnormality if the breath in or out is incomplete. Repeating the manoeuvre helps, but some people cannot produce technically acceptable measurements.

The test measures volume and resistance, not lung structure. A CT scan is better for showing emphysema, scarring, or other physical changes. Spirometry is the main test for measuring forced airflow, while a gas-transfer test examines how well oxygen moves from the lungs into the blood.

Risks and complications

The test is non-invasive and does not expose you to radiation. Brief breathlessness, light-headedness, coughing, or anxiety in the enclosed booth can occur and usually settles when the manoeuvre stops.

Tell the technician immediately if you develop chest pain, marked dizziness, or significant breathing difficulty. The test can be stopped and the booth opened.

What happens next

A respiratory specialist or the healthcare professional who ordered the test will interpret the measurements alongside your other results. Routine follow-up may involve discussing whether the pattern is normal, repeating a test, changing monitoring plans, or arranging another investigation.

An abnormal value does not automatically mean you have a particular disease. Technical quality, medicines, current symptoms, and previous results all matter.

Do not wait for a routine test report if you develop severe or rapidly worsening breathlessness, chest pain, fainting, confusion, or blue or grey lips. These symptoms need urgent or emergency medical assessment.

Common questions

Can I drink coffee before lung plethysmography?

Usually, yes, because fasting is not normally required. Follow your centre's instructions if caffeine must be avoided for another test being performed at the same appointment.

Does the time of day matter?

Lung function can change slightly during the day, but the test can generally be performed at any scheduled time. Follow-up tests may be booked at a similar time when close comparison is important.

Can I exercise beforehand?

Avoid vigorous exercise for the period specified by your testing centre. Recent exercise can temporarily change breathing and airway measurements.

Should I take my inhalers before the test?

Only as instructed. Some tests assess your breathing while using your usual treatment, while others require certain inhalers to be withheld for a set time.

What if I am claustrophobic?

Tell the staff before the test. The booth is transparent, communication remains possible, and the door can be opened if you need to stop.

Can I drive home afterward?

Most people can drive and return to normal activities immediately. Wait until any brief dizziness or breathlessness has fully settled.

Sources

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