

Understanding Your Breath-Hold: It's About More Than CO₂

Many people are told that a short breath-hold time simply means they are sensitive to increases in carbon dioxide (CO₂) levels. In reality, although CO₂ plays an important role in the urge to breathe, breath-hold performance is influenced by a complex interaction between the respiratory system, nervous system, breathing muscles, metabolism, and psychological factors.



Is CO₂ the Only Factor? No!

Although rising CO₂ contributes to the urge to breathe, studies have shown that people reach their breath-hold "breaking point" at very different CO₂ levels. There is no single CO₂ threshold at which everyone must breathe.

This suggests that other factors play an important role in determining how long a person can comfortably hold their breath.



The Importance of the Diaphragm

The diaphragm is your main breathing muscle.

During a breath hold, the brain continues to send signals to the diaphragm, asking it to breathe. At the same time, you are consciously preventing that breath from happening.

As the breath hold continues:

- The respiratory centre continues generating an increasing drive to breathe.
- Involuntary contractions of the diaphragm may occur.
- Neural signals to the breathing muscles become stronger.

Research suggests that sensory signals arising from the diaphragm and other breathing muscles contribute significantly to the sensation of air hunger and may influence the point at which a breath hold ends.

The Role of the Brain

Your breathing is controlled by specialised sensors called chemoreceptors. They monitor CO₂ levels, Oxygen levels and pH of the blood and surrounding tissues.

When changes are detected, signals are sent to the brainstem, which adjusts breathing accordingly. How the brain interprets and responds to those signals also affects breath-hold performance.

Breathlessness is not simply a physical sensation, it is a perception created by the brain

using information from many sources, including:

- Chemoreceptor input
- Feedback from the body's physical sensors
- Emotional state
- Prior experiences
- Attention
- Expectations

Psychological Factors Matter Too

Breath holding is not purely physical.

Your thoughts, emotions, and stress levels can all influence how long you can comfortably hold your breath.

Factors that may reduce breath-hold time include:

- Anxiety
- Stress
- Fear of bodily sensations
- Previous experiences of breathlessness or panic
- Feeling uncomfortable with breathlessness
- High levels of mental arousal



Some people with breathing pattern disorders become highly aware of bodily sensations, which can make the urge to breathe feel stronger or more distressing.

Factors That May Support Longer, More Comfortable Breath-Holds

Physical Factors

- A functional breathing pattern
- A relaxed diaphragm and chest wall
- Lower metabolic demands
- Good physical fitness
- Good general health

Mental Factors

- Relaxation
- The ability to tolerate discomfort
- Meditation or mindfulness
- Helpful distraction techniques
- Lower stress or arousal levels

Your own breath-hold time may be more useful for monitoring progress than comparing yourself with others.

Can Breath-Hold Time Be Improved? Yes!

Many factors influencing breath-hold time can be trained.

Helpful strategies include:

Improve Everyday Breathing

- Breathe gently through the nose where possible.
- Reduce unnecessary over-breathing.
- Practise relaxed diaphragmatic breathing.

Learn to Relax

Relaxation reduces oxygen demand and can lessen the sensation of air hunger.

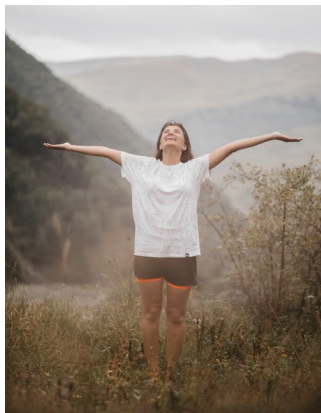
Reduce Fear of Breathlessness

Understanding that air hunger is a normal sensation can help reduce anxiety around breath-holding.

Practise Consistently

Regular, gentle breath-hold practice often leads to gradual improvements in comfort and duration.

Take Home Message



Breath-hold time is influenced by far more than carbon dioxide levels alone. It reflects the interaction between the body, the brain, and the breathing system.

Rather than focusing on a number, think of breath-hold time as a window into the resilience and adaptability of your breathing system. Improvements often come not from trying harder, but from breathing better, relaxing more deeply, and becoming more comfortable with the natural sensations that arise during a breath hold.