



by Sebastian Naslund ©  
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from the booklet "Freediving Theory"

See also [Freediving and awareness](#)

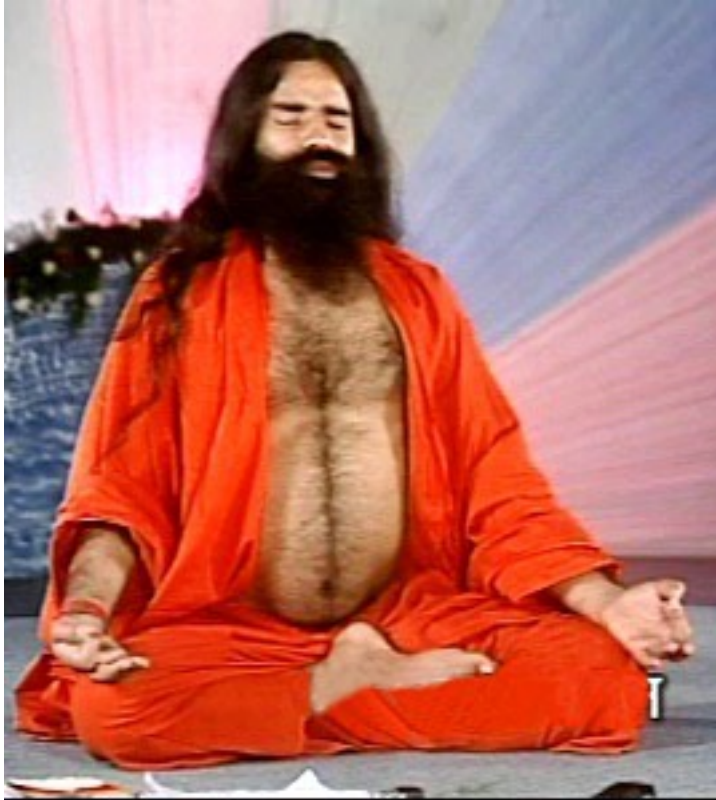
## **Breathing like a YOGI**

- the key to greater depths in freediving.

Not really. Newcomers that wants to get serious in competitive freediving get very stuck up by the idea that there is something wrong with their breathing, and that they must learn some secret special kind of breathing in order to develop. And some instructors are happy to endorse this fallacy. Usually referring to some ancient yoga technique or world champion behavior.

Abdominal breathing, subneutral breathing, psychic breathing, purges, sub-dominant breathing, fire breathing, nadi shodan, bastrika, kapalabati, breathing cycles, 4-section breathing, slow ventilation e t c

The placebo effect is of course great. You will feel full of confidence after having done your three and a half cycles, of slow this, fast that, deep this, and blocking here and there, resting 12 secs, doing a purge, and than a slow inhale followed by a subdominal relax release. **NOW YOU ARE READY TO GO.**



**It's mental**

That's the thing, we never feel ready to go. Holding our breath diving into depth is such a un-natural thing to do. There will always deep down be reluctance to stop breathing.

So you must use mind games to convince yourself - yes now I am ready. Using your breathing to boost your confidence. And in the end the only major thing you are doing in 90% in all these "techniques" is lowering your natural CO2 (hyperventilation) and get contractions later.

And you say: "Wow, yes it worked - thank you for the advice".  
"That guy is a genius he helped me add 45 seconds to my PB".

**Nevertheless, breath is a tool that can affect body and mind.**

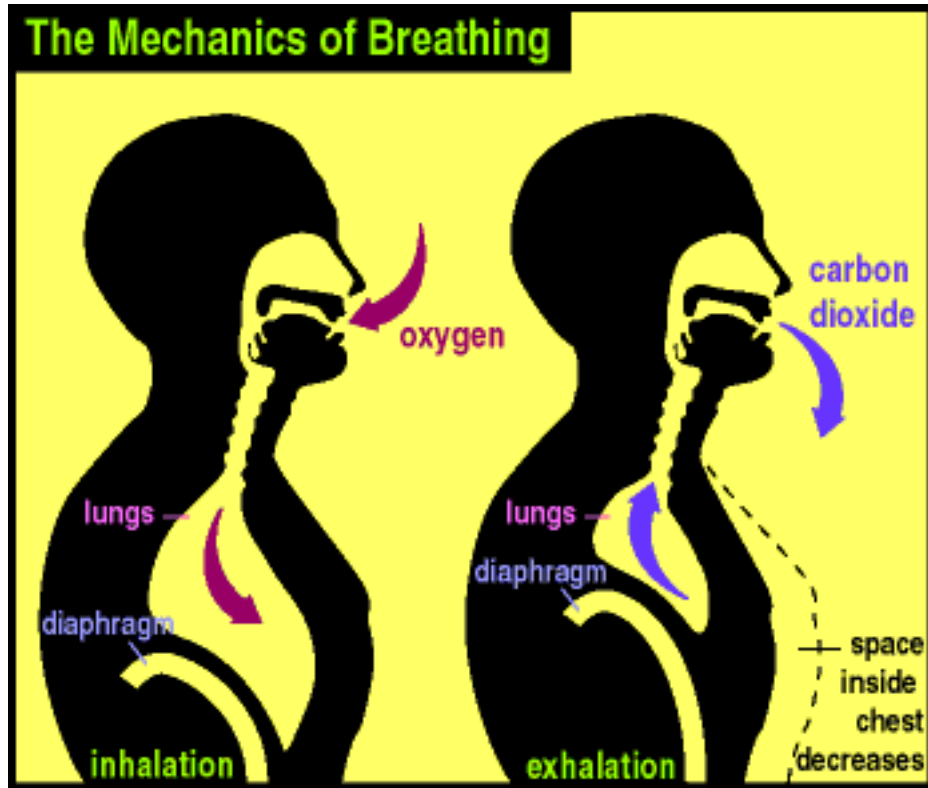
Yes you can slow your heartbeat by controlling your breath.

Yes certain breathing can regulate blood pressure.

Yes breathing can affect the acidity of your blood.

Yes breathing can be used as a focus point and reduce brain activity and calm the neural system.

Yes you can get more O2 with changing your breathing.



### **Imitate the best?**

Top level freedivers have spent a decade or more trying out different preparations before a deep dive. They have come to choose a preparation that suits their bodies, their metabolism, their fitness level, their muscles, their choice of equipment, their choice of temperature, their choice of speed and their mental temperament.

The gullible beginner chooses the champion that is deepest or most serious and pays close attention thinking he should copy this champion. Thinking that there is ONE ultimate way of preparing for a dive.

### **Truth is:**

- In every stage of your freediving career you will have to try different things in order to evolve and to become aware of your body and its reactions to breathing and apnea. Trying to find the ultimate breathing or just copying a champion is... well, it could be counterproductive. During your freediving career your body will change, and so must your training and preparation methods.
- Every new day of diving is a unique situation. Temperature, your current metabolism, tiredness, suit, surface conditions, your squeeze depth, wind etc, it is all part of an equation that could demand a different breathing approach related to the circumstances.
- You are not normal, nobody is normal. Your body looks as different on the inside as on the outside compared to the next guy. Some people don't get contractions, some people have naturally high metabolism (burning of O<sub>2</sub> in the cells), some people have (or get) more acidic blood than others, some people have lower base-tension in the body etc.

Bottom line: there is no ultimate breathing preparation.

### **What can I do with my breath?**

You can reduce heart rate. Just stop breathing or focus on slow exhales (preferably by blocking slightly at the epiglottis). But remember heart rate is not only decided by your body's need for oxygen (your metabolism). It is also regulated by your stress levels (hormones released in the blood and neurotransmitters firing off in the brain), and your health status, and more.

You can increase O<sub>2</sub> levels above normal. Just breath out fully (down to RV) and do a bigger than normal inhale (above Tidal volume to TLC). This will increase O<sub>2</sub> levels in lung from maybe 14% to 16% (an example). Or... just hyperventilate (which a big inhale should be categorized as as well). Hyperventilation can increase O<sub>2</sub> levels in the lung up to 18-19%. (Remember the outside air contains 21% oxygen, but in your lung this is decreased by the release of [CO<sub>2</sub>](#) into the lungs).



But increasing the amounts of O<sub>2</sub> in your lungs does not mean you have ACCESS to more O<sub>2</sub> in the body. And having access to more O<sub>2</sub> in the body is not the same as having access to more O<sub>2</sub> in the brain. <http://freediving.biz/education/O2.html>

Just as a curiosity I have an intuitive idea that a few packing sessions before the max attempt, stretches out the inside of your lungs and "opens up" the alveoli and O<sub>2</sub> uptake can be slightly more efficient. This is just a hypothesis.

### **What makes you breathe**

The purpose of breathing is to oxygenate your blood. But also to get rid of excess CO<sub>2</sub>. We have no real use of CO<sub>2</sub>, it is a waste product of metabolism. The breathing is mainly controlled by the levels of CO<sub>2</sub> (ultimately directed by the nervous system). In my case at certain days my CO<sub>2</sub> threshold lies around 40 mmhg CO<sub>2</sub> (see [CO<sub>2</sub> tests](#)). This means my diaphragm creates a contraction (a breathing manouvre) every time I reach 40 mmhg

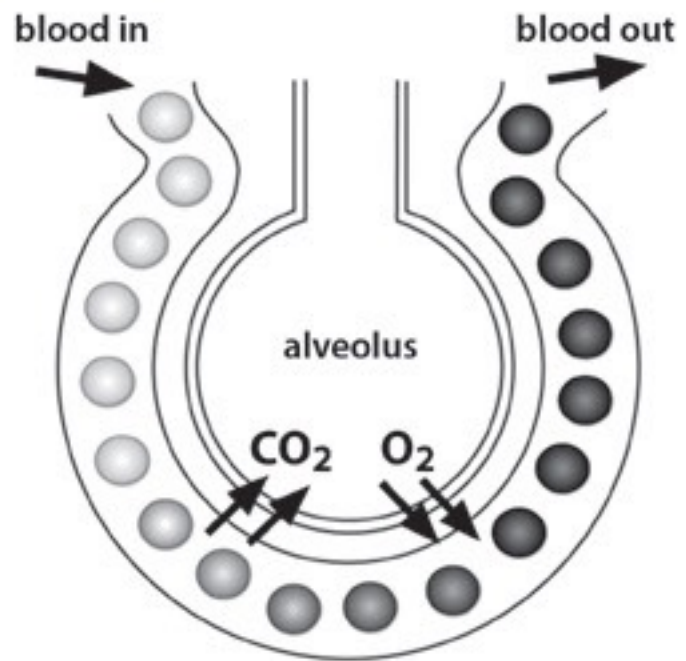
CO<sub>2</sub>. This is also the case in normal "tidal volume breathing". I am balancing on the edge of about 40 mmhg, the diaphragm (and intracostal muscles) producing the soft repetitive movement that is our breathing (the nervous system is the "computer" in this process).

Worth mentioning is that CO<sub>2</sub> levels are "only" 80% of what dictates our breathing mechanism. Other factors are involved, such as oxygen levels and sometimes pure emotions. There are also stretch sensors in the lungs being part of the breathing mechanism.

As mentioned above a lot of breathing (ventilation, hyperventilation) does mean you maximize the levels of O<sub>2</sub> in your lung (the full lungs carries about 50% of your oxygen during a breath hold), BUT it does not necessarily mean that your body or brain have access to more O<sub>2</sub>. Low levels of CO<sub>2</sub> creates vasoconstriction in the brain, in plain language: blood flow (and delivery of O<sub>2</sub>) is restricted. This is why you can actually black out while hyperventilating vigorously.

Signs/ symptoms of over ventilation can be: dizziness, numbness or tingling feeling (in extremities such as fingers, lips, toes). Maybe a metallic taste in your mouth. This should be treated as warning signals.

## the gas exchange



Yoga



Breathing is not just about oxygen or CO<sub>2</sub>. Breathing can be used to calm your self, the heart, the nervous system, the blood pressure. A way to reach homeostasis in an aroused body. Yoga uses several breathing techniques to manipulate physical and mental states. One easy way is to block your air at the epiglottis, controlling the flow of air into a steadier calmer flow. Slowly in and out in a calm and erect body position. This is the basic breathing technique in parts of yoga mediation: psychic breathing.

Fact is, your normal breathing is seldom steady in the sense that it has a steady flow. The breathing described above can create this even flow that regulates among other, blood pressure.

You can also switch to a slightly swifter inhale and instead prolonging the exhale with the blocking, thus calming heart and slightly increasing oxygen saturation pressure in lung and maybe increasing blood pressure slightly. Yoga breathing is basically about controlling prana - life energy. Or if you are skeptical to that notion - it is about maintaining health and energy levels. Kapalabati, Nadi Shodan, fire breathing, psychic breathing can be used to learn to control your breathing apparatus. And while controlling breathing, you are increasing mental control at the same time, since the mind is involved in all motoric activities.

The fact that ancient yoga describes the breath as the "body conditioner" and that buddhist monks refer to the breath as the "body" of breath indicates that there is more to it than just shuffling oxygene and carbon dioxide back and forth in a mechanical way.

The buddhist basic meditation technique (Anapanasati) uses focus on the breathing process as a mental mantra. Thus calming the mind and after a lot of training - one-pointing the mind. And reducing brain activity (remember brain uses 20-30% of your O<sub>2</sub>). But remember: controlling the content of your mind is much harder than controlling your motoric skills (movements). Setting a national record in freediving is easier than becoming a master of meditation.

**Breathing before freediving.**

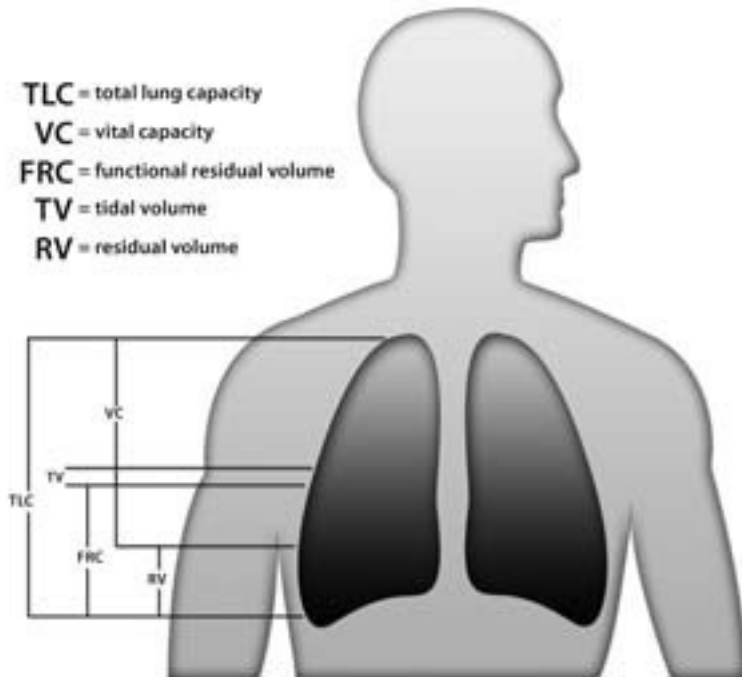
Some top level athletes do very little breath up. Ryozo Shomineda, William Trubridge, Guillaume Nery Alexey Molchanov are very calm before their dives. But Herbert Nitsch is outright hyperventilating. Carlos makes a few purges (forceful exhales) before he goes. Trubridge does a few gentle but deep exhales (one may call it sub neutral).

Most mid level athletes do slow deep breathing (could be called sub dominal breathing or belly breathing).

Bottom line is, however careful you watch your breathing, freediving always involves a certain degree hyperventilation as defined by medical standards. Even the small sub neutral breaths of Trubridge most likely lowers his CO2 below normal - but not much (educated guess).

Trying 3 sub-neutral exhales while monitoring CO2 I see a drop from 40 to 20 mmhg on myself.

## lung volumes



*Graphics:* Phoebe Skotida,  
from the booklet "Freediving Theory"

### **In the end its all about CO<sub>2</sub>**

However you breath, in what volumes, intervals, purges, sub dominal e t c the only interesting thing is: how much CO<sub>2</sub> do you want to have when you leave the surface.

High levels of CO<sub>2</sub> increases blood flow to the brain (vasodilation), and (worth mentioning again) the opposite, if you ventilate a lot that will create vasoconstriction and less O<sub>2</sub> reaching the brain.

Hyperventilation causes acidity in the blood. The “Bohr effect” thus makes the O<sub>2</sub> molecules less likely to be released when needed.

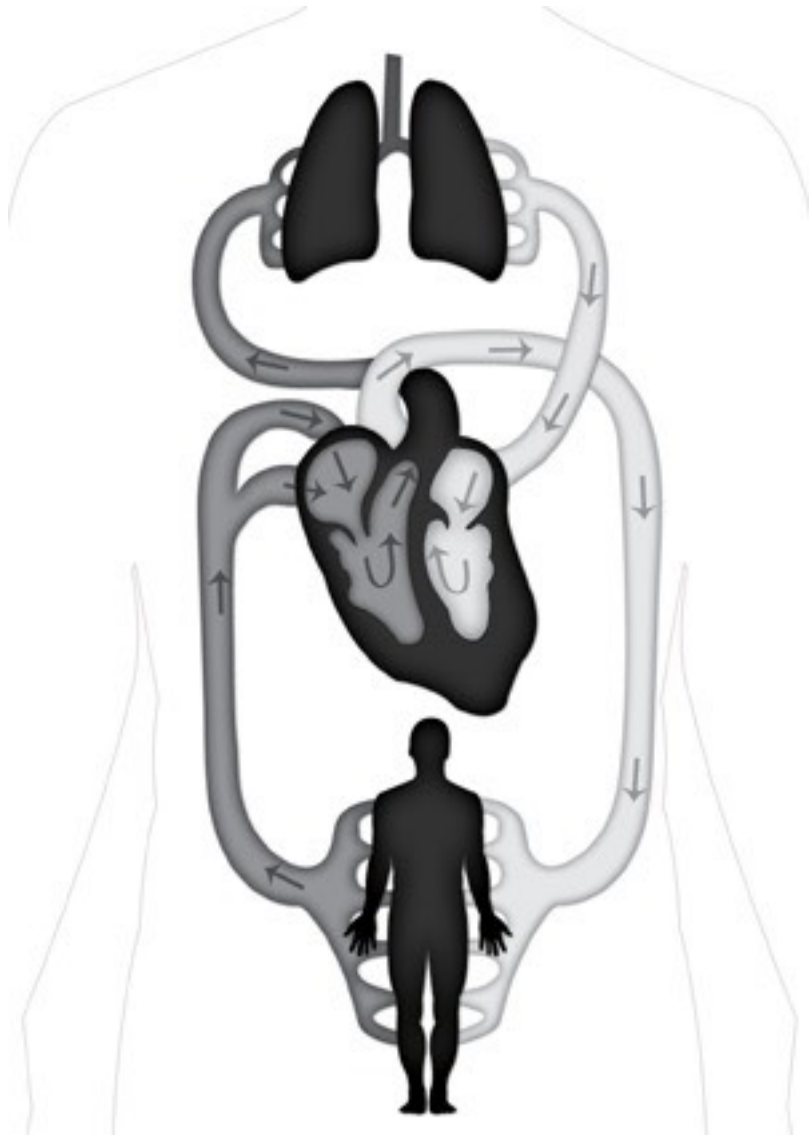
There are many good reasons to breath as little as possible and endure early contractions.

But one must remember that contractions:

- 1) Can spoil equalization efforts (make you lose mouthfill).
- 2) Can increase risk of squeeze.

So it is basically about how much CO<sub>2</sub> you can you endure.

*Picture right: Arteries (blood channels) distributes new blood from the lungs, full of oxygen. Venous return brings back "taxed" blood to the lung. Blood with CO<sub>2</sub> and lower levels of oxygen. After breath hold artery system is oxygenated quickly, but the venous return may need several minutes of breathing until the system is back to normal levels.*



**Diving with high levels of CO<sub>2</sub> is not applicable for beginners. Tolerance to CO<sub>2</sub> is a slow process.**

When talking about CO<sub>2</sub> tolerance one must acknowledge that we are most likely talking about a mental tolerance. There might be such a thing as slowly pushing your reaction levels, a grey zone between mind and body.

In the long run, deeper and longer dives will have to be based on less breathing. But one would be unwise not to do 2-3 full breathe outs (down to almost RV) before a deep dive since just a few breaths can increase total O<sub>2</sub> volumes by 5%. And here sub-neutral breathing is the fastest way. Breathing between FRC and (almost) RV as effortless as possible..

Worth mentioning is that there is a reason why yoga breathing techniques always involves breathing through nose. Your blood gets more oxygenated if you breath from the nose. In our sinuses lives a nitric bacteria that follows our inhale down to the lungs. This bacteria acts as a signal for the blood to find the new air in the lungs. New air is the most oxygen rich. Breathing through the nose also cleans and warms the air as it passes through the sinuses.

## **Sebastian Naslund**

*Sebastian studies Sport Psychology, yoga and meditation. He runs a freediving school in Sweden, competes in World Championships and has had several National Records. He has written two books about freediving.*

**TV** – Tidal volume (the volume of air while breathing normally)

**TLC** – Total lung capacity (your full lung)

**FRC** – Functional Residual Volume (the volume left after a passive exhale)

**RV** – Residual volume (what is left after a total exhale)

**Packing** – a way of pressing more air than TLC into the lung.

**Epiglottis** – a muscle in the throat that can seal (by will or by reflex)

Acidity/alkaline -

**Metabolism** – the burning of O<sub>2</sub>

**CO<sub>2</sub>** – carbon dioxide (the “waste product” of metabolism)

**O<sub>2</sub>** - oxygen

**Abdominal breathing** – breathing low in the chest, belly breathing.

**Full breath breathing** - abdominal breathing that also involves the higher chest.

**Sub neutral breathing** – below FRC

**Psychic breathing** – controlling the breath with the epiglottis

**Purges** – quick forceful exhale

**Sub-dominant breathing** – most likely the same as sub-neutral breathing.

**Fire breathing** – forceful purges through the nose, “powered” by stomach contractions.

**Nadi shodan** – a slow breathing through alternate nostril.

**Bastrika** – a breath up (similar to kapalabati) and breath hold (and lock) in pranayama

**Kapalabati** – a type of yoga breathing, similar to fire breathing, but slightly milder.

**Breathing cycle** - inhale and exhale

**4-section breathing** - using stomach, ribs, top chest and back chest in an inhale.

**Slow ventilation** – is usually also hyperventilation although slower



Freediver Stig Severinsen has written a book about breathing. See [Breathology](http://www.abc-of-yoga.com/pranayama/)  
<http://www.abc-of-yoga.com/pranayama/>