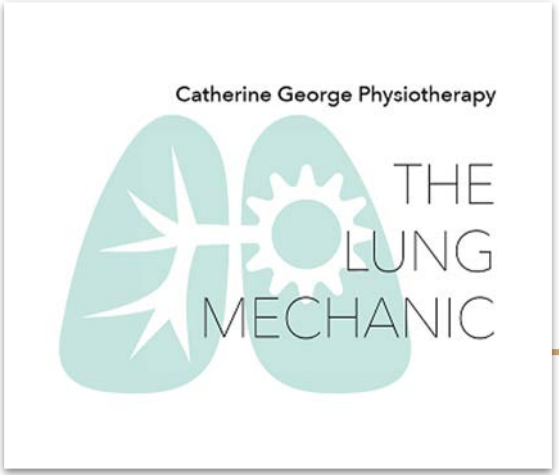
It's all in the way you do it

Breathing 101: how to get the best out of yourself and your patients.



Outline

What is normal breathing

What drives our breath and what does our breath drive?

What can we do about it?

For our patients

And ourselves

Catherine George Physiotherapy

THE LUNG MECHANIC

So…… what is normal breathing?

Nose/mouth

Upper chest/ diaphragm

Inspiratory:expiratory ratio

Respiratory rate

Breath hold test

The Wonderful nose

1. Warms, moistens, filters the air
2. Nitric Oxide
    a. Vasodilator, stimulator of cilia, sterilises, anti inflammatory, alar muscles
3. Reduces volume and rate
4. Tells our body we are safe
5. 10-30% more oxygen uptake

Catherine George Physiotherapy

THE LUNG MECHANIC

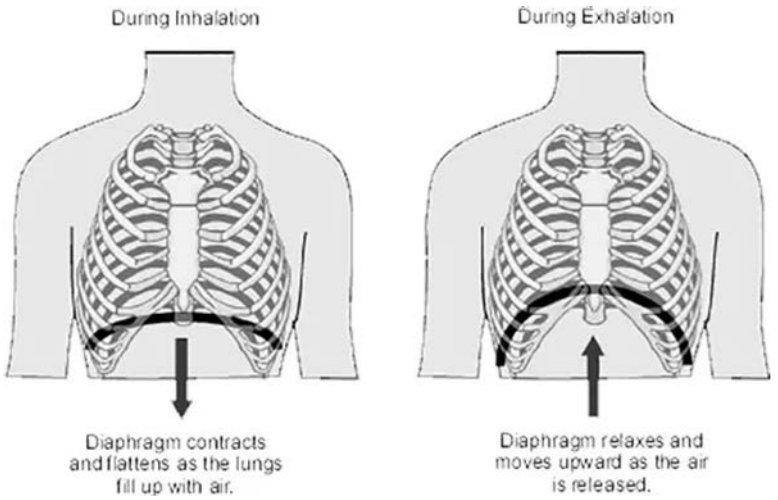
Our body's powerhouse - the diaphragm

1-2% energy/oxygen uptake vs up to 30% chest

Draws the air in like a pump

Better distribution to lower parts of the lung

Tells our body we are safe!



Inspiratory:expiratory

Active inhale.....passive exhale

Exhale 1.5-2x inhale

Inhale = sympathetic Exhale = parasympathetic

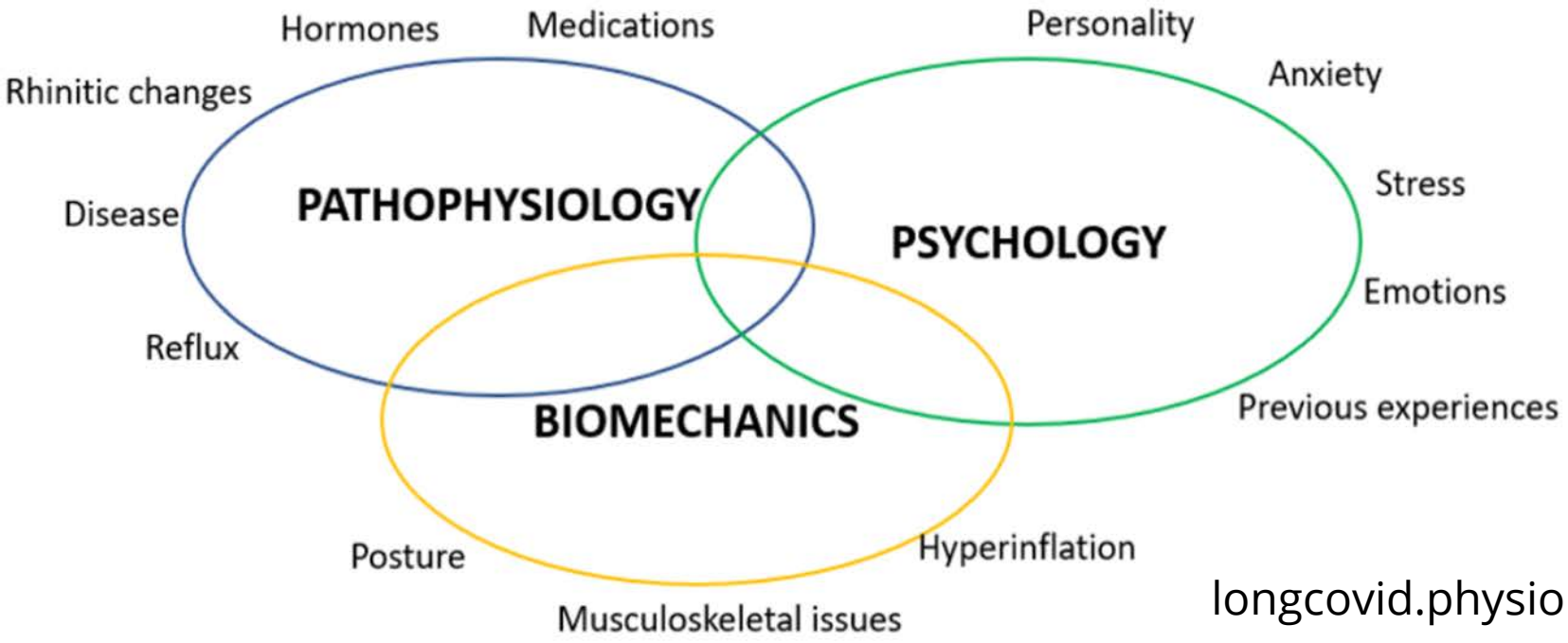
Inspiratory BHT 45-60 sec Exhale BHT 30 sec

Respiratory rate 8-12/minute

Catherine George Physiotherapy

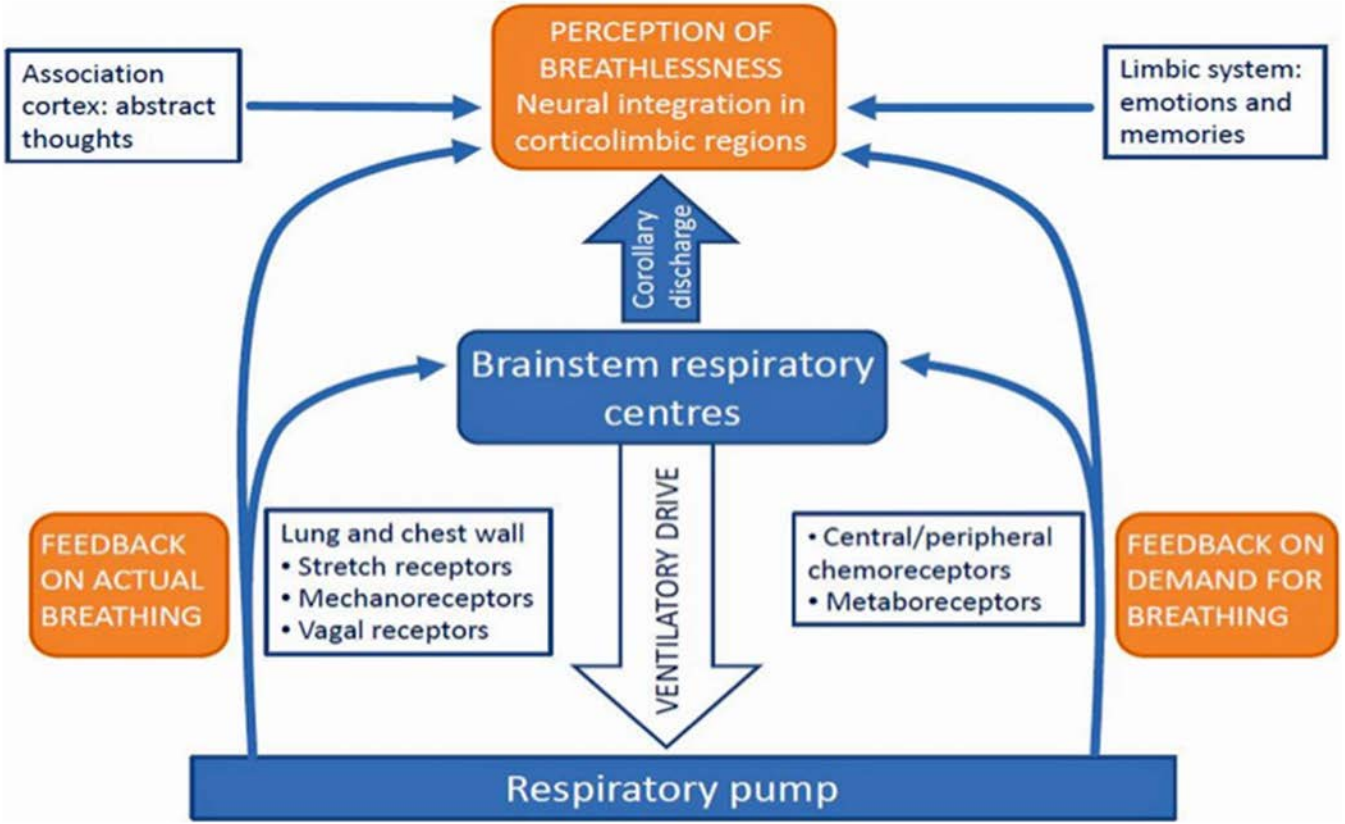
THE LUNG MECHANIC

What drives our breath and what does our breath drive?

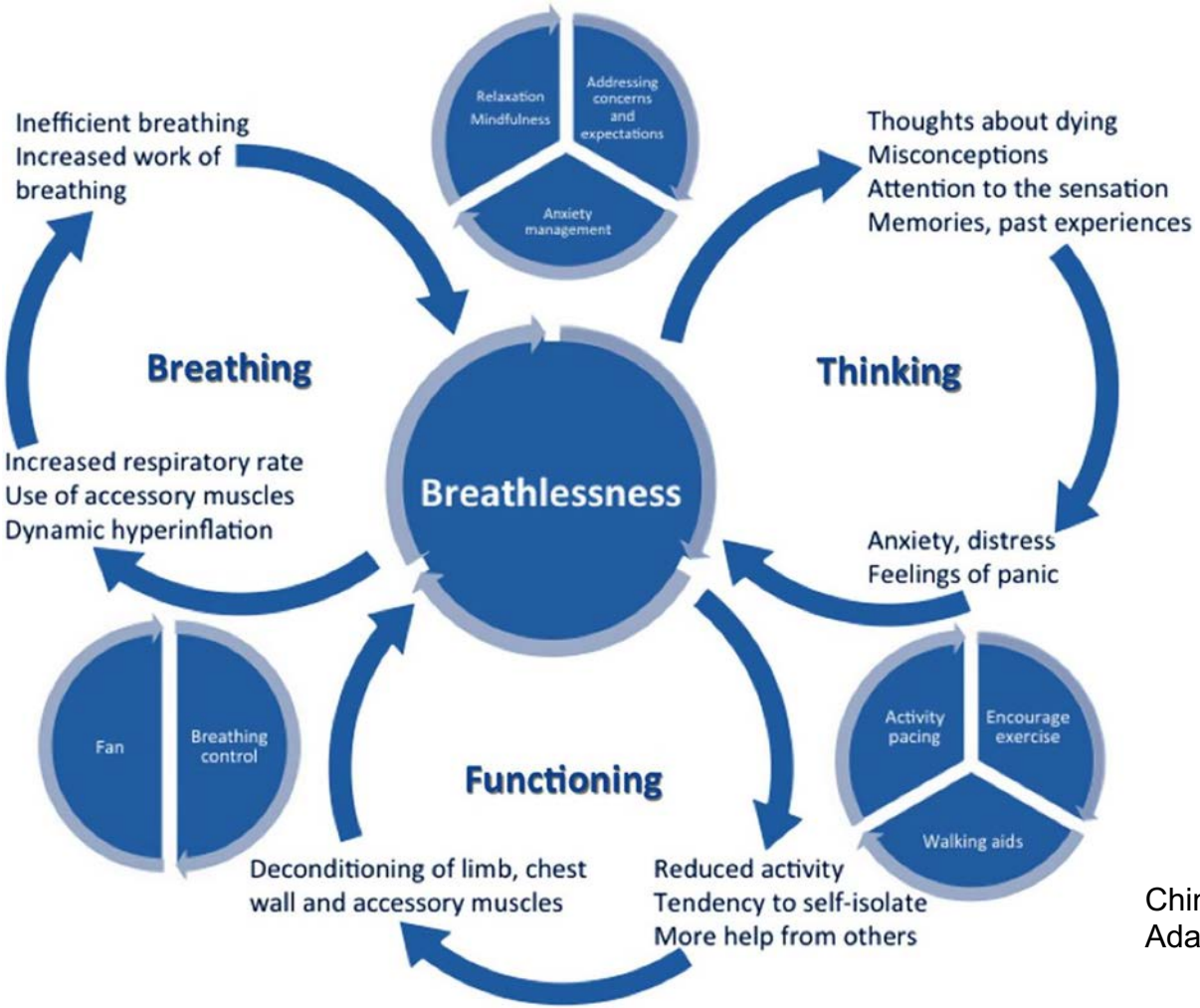


longcovid.physio

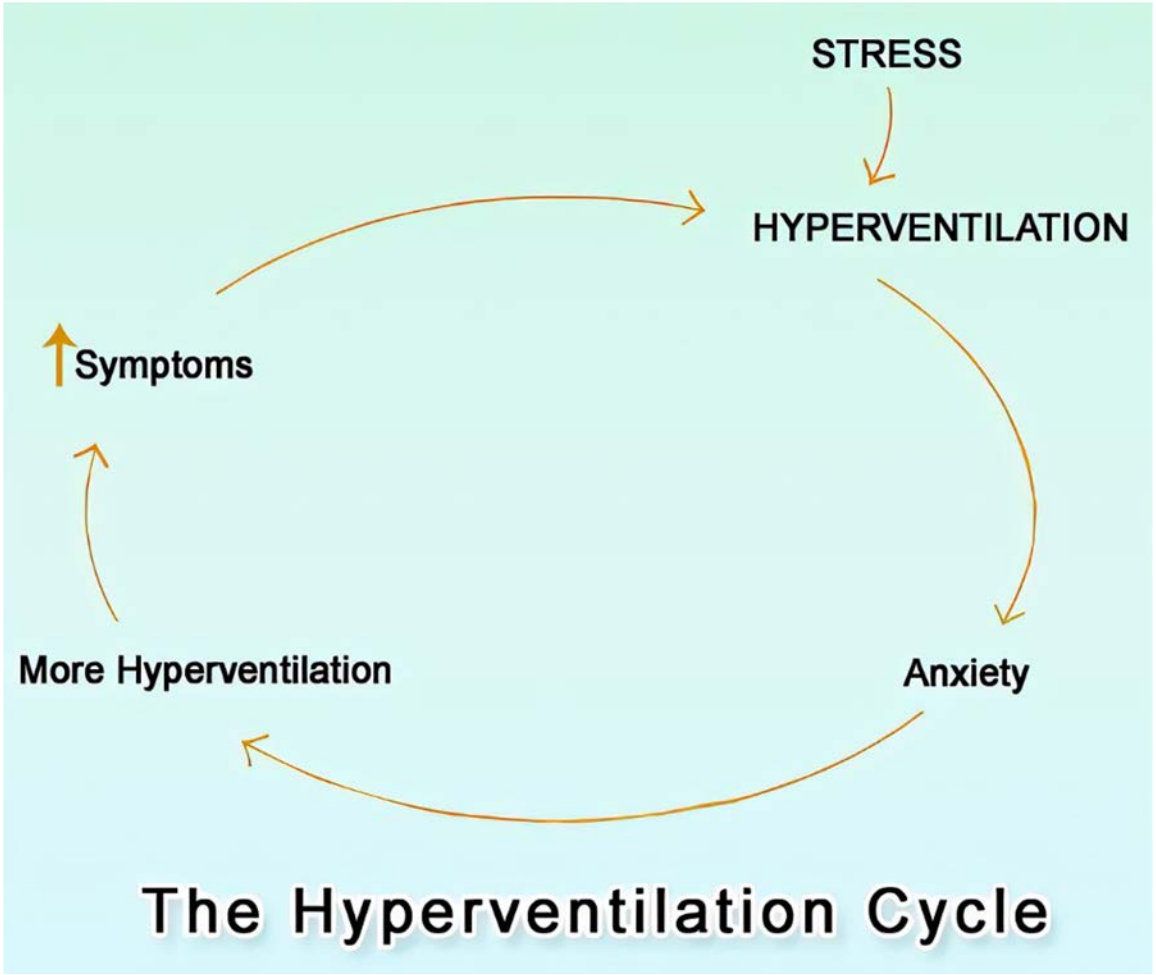
Pathophysiology - be wary the tattooed archbishop

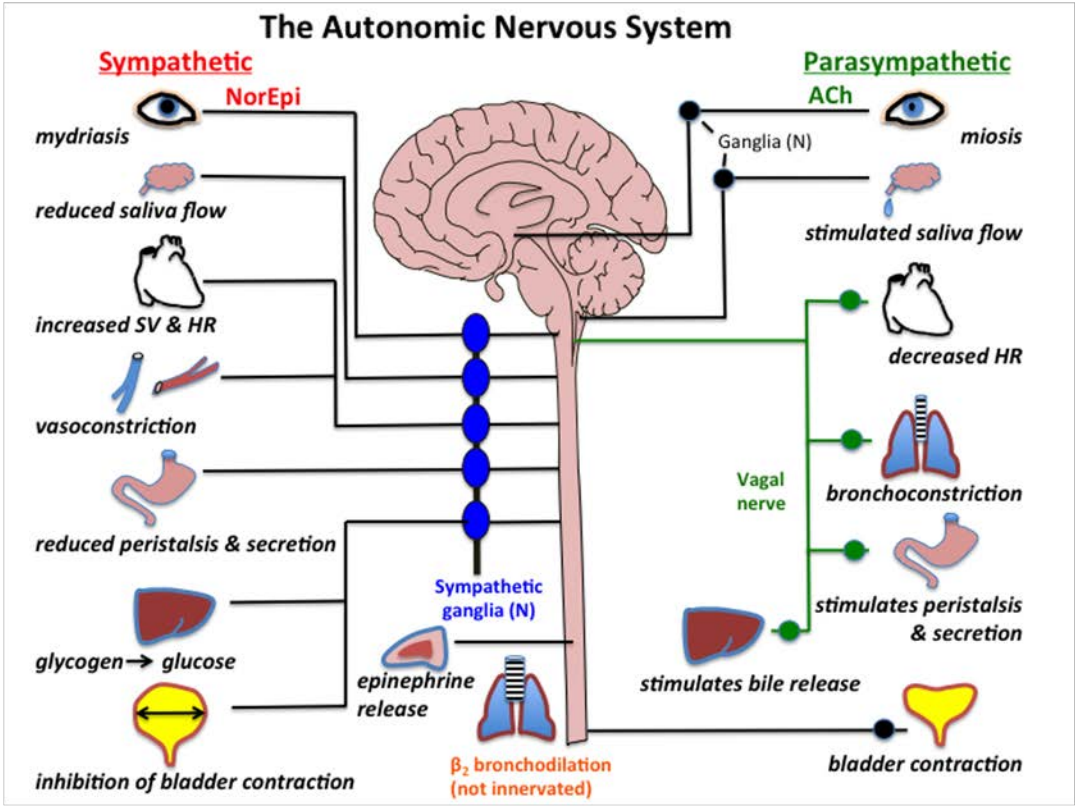


Booth et al 2014



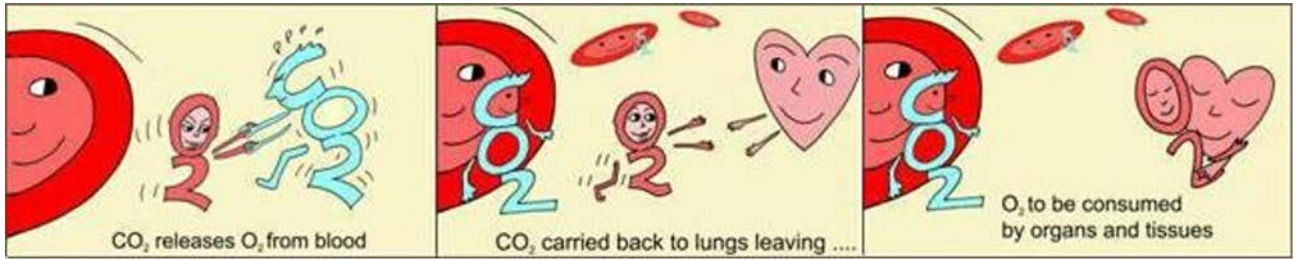
Chin and Booth 2016
Adapted from CBIS


STRESS
HYPERVENTILATION
Anxiety
More Hyperventilation
Symptoms
The Hyperventilation Cycle


The Autonomic Nervous System
Sympathetic
NorEpi
Parasympathetic
ACh
mydriasis
miosis
Ganglia (N)
reduced saliva flow
stimulated saliva flow
increased SV & HR
decreased HR
vasoconstriction
Vagal nerve
bronchoconstriction
reduced peristalsis & secretion
stimulates peristalsis & secretion
Sympathetic ganglia (N)
glycogen → glucose
stimulates bile release
epinephrine release
inhibition of bladder contraction
β2 bronchodilation (not innervated)
bladder contraction

Oxygen vs carbon dioxide

- Carbon dioxide rising in the brain = take a new breath



- Breathing more
  - Only so many red blood cell for O2 to attach to
  - Reduce Co2 (blow more off)
  - reduced oxygen to tissues
- Normal Sp02 97-98%

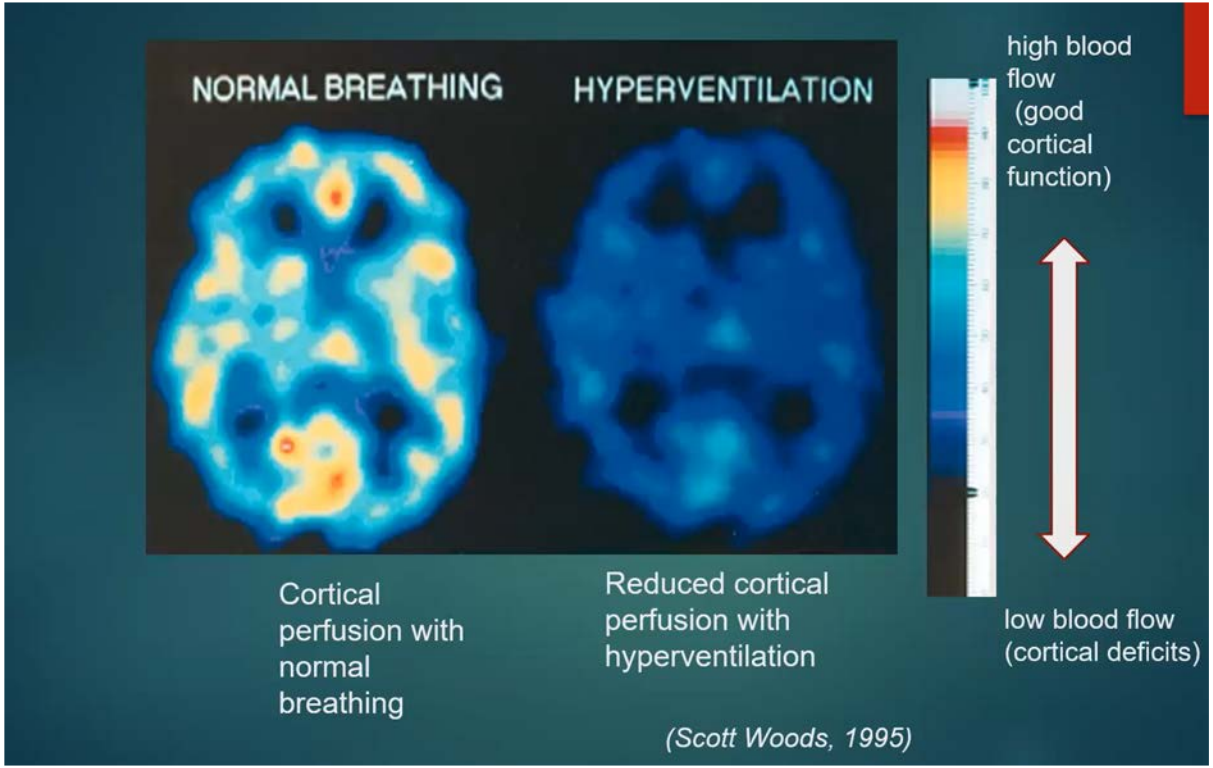
Hypocapnia (low CO2)

- CO2 works as an acid in our bodies
- Hypocapnia therefore affects every cell in our body
- Increased binding of oxygen to red blood cells - less oxygen into the cells
- Decreased NO release by Hb = vasoconstriction
- Electrolyte shift - causes low calcium, potassium, phosphate levels
- Leads to smooth muscle constriction - gut, bronchi, vasculature
- Skeletal muscle and neuronal hyperexcitability, metabolism changes, contractility, weakness
- Major loss of bicarbonate and sodium
- Can reduce blood flow to the brain by 50%

Net result is less oxygen and glucose for cell use - disrupting function

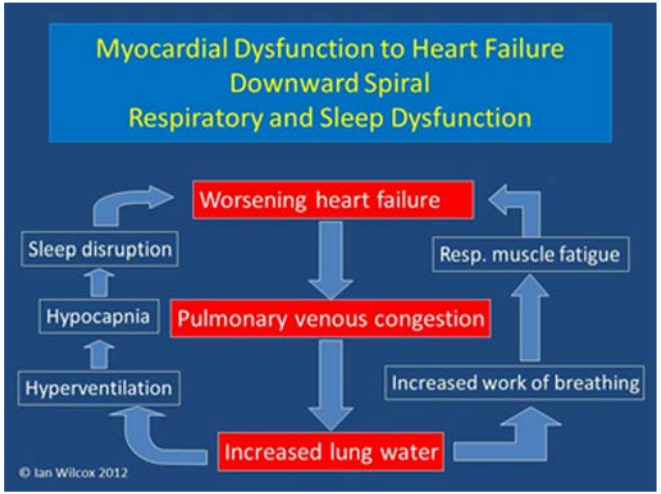
Hypocapnia - symptoms

- Neurological
  - Epilepsy, headaches, blurred vision, brain fog, dizziness, reduced balance, tinnitus, attention deficit, confusion, burnout, fatigue, pins and needles, numbness, faint, cerebral hypoxia
- Respiratory
  - Shortness of breath, air hunger, sigh and yawn, cough, chest tightness, asthma, chest pain
- Cardiac
  - Palpitations, raised heart rate, arrhythmias, ECG changes, angina symptoms. Pain, myocardial hypoxia, raised BP, lowered BP
- Musculoskeletal
  - Tremble, twitch, shiver, sweat, cold hands an feet, weakness, tetany, pain, hyperreflexia, difficult to swallow,
- Psychological
  - Anxiety, trauma, anger, labile, performance anxiety, worry
- Gut
  - Nausea, cramps, bloatedness, exacerbation of sensitivities
- Other
  - Poor sleep, poor exercise tolerance, dry mouth,bladder hyperexcitability,



For every 1mmHg drop in CO_2 there is a 2% reduction in cerebral blood flow

How does this affect cardiac patients?



Reduce Length Of Stay In Hospital

Respiratory rehabilitation is standard care for surgical patients and includes deep-breathing exercises, thoracic physiotherapy, **incentive spirometry** and preoperative IMT.

Training your breathing muscles at home prior to surgery has been shown to make breathing easier, as well as helping to strengthen your respiratory muscles after surgery. In fact, this systematic review into **'Preoperative IMT for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery'** shows that breathing muscle training before surgery reduced the risk of some lung complications after surgery, as well as, the length of hospital stay, compared with usual care.

Furthermore, this **clinical trial** found that just five days of preoperative IMT reduced the incidence of postoperative pulmonary complications and duration of postoperative hospitalisation in patients undergoing cardiac surgery.

Reduce Future Risk Of Heart Disease

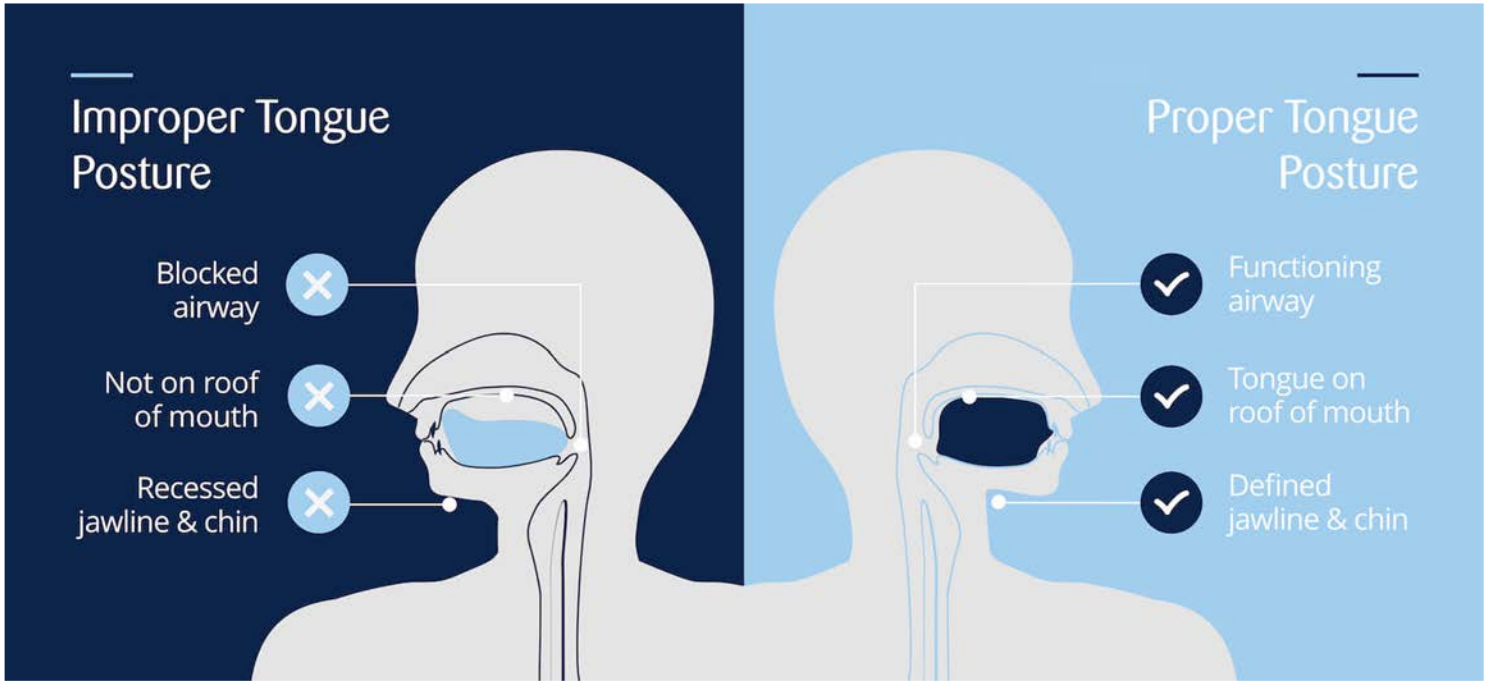
In patients with chronic heart failure, IMT, such as with **POWERbreathe Medic** IMT, has been shown to:

- **Improve exercise tolerance by 19%**
- **Improve quality of life by 16%**

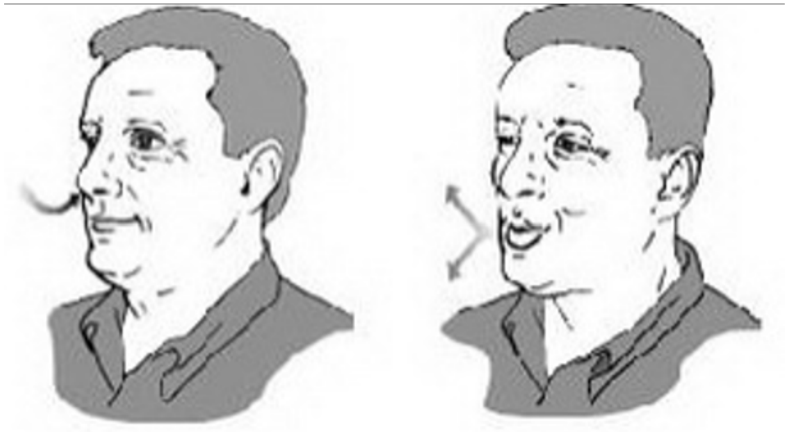
POWERbreathe IMT can be used alongside your regular medicine as it is drug-free, clinically-proven and has no side effects or drug interactions; just speak to your GP first. Read **Precautions and Contraindications**. And because the cardiovascular strain of POWERbreathe IMT is very low, it's suitable for even the most physically compromised patients.

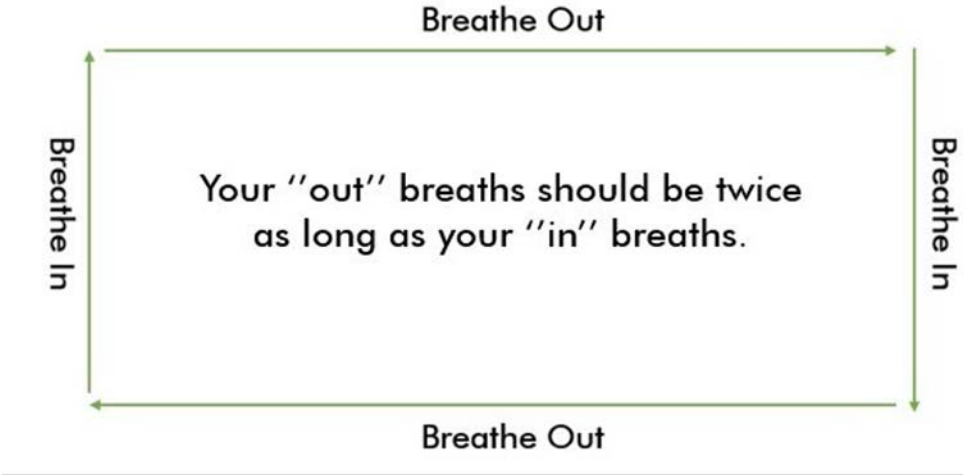
How can we help our patients and ourselves?

Don’t eat through your nose…

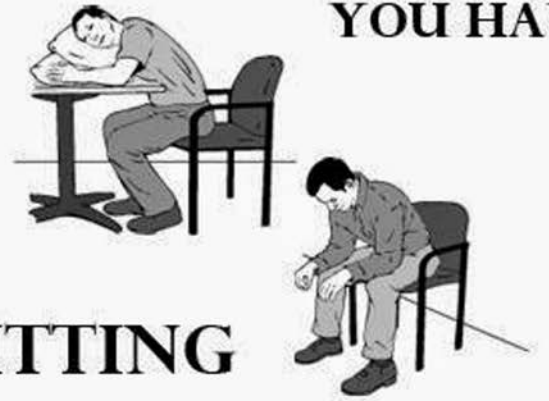


Breathe OUT!




Breathe Out
Breathe In
Your ''out'' breaths should be twice as long as your ''in'' breaths.
Breathe In
Breathe Out

POSITIONS TO RELAX WHEN YOU HAVE SHORTNESS OF BREATH



SITTING

STANDING

SLEEPING

Charak

Health Forever...Naturally

Bottoms up - improve efficiency