

The Power of Breath

A presentation by Dr. Shiv Talwar



Dr. Shiv D. Talwar

- Undergraduate degree in Civil Engineering from Punjab University, India
- Master's in Civil Engineering from Lehigh University, Pennsylvania
- Ph.D. from University of Waterloo, Canada
- Founding member of Spiritual Heritage Education Network Inc., and president since 2000
- Researches and promotes education about the impact of conscious deep breathing on your life
- Raising awareness to care for ourselves and each other



The Common Ground by Dr. Talwar

- Award winning book- Books for Peace International Award 2022
- “masterpiece on the unity of science and spirituality”
- Book Synopsis:

People have a fragmented vision of the world, seeing its diversity but not the underlying oneness. Ethnic violence, environmental degradation, and other issues stem from this fragmentation. To solve it, he suggests a radical new style of education aimed at bringing people together despite their differences.

To get there, he draws on both ancient spiritual wisdom and modern physical and biological research. There are various religions, but there is only one knowledge, and that wisdom converges with scientific truths.

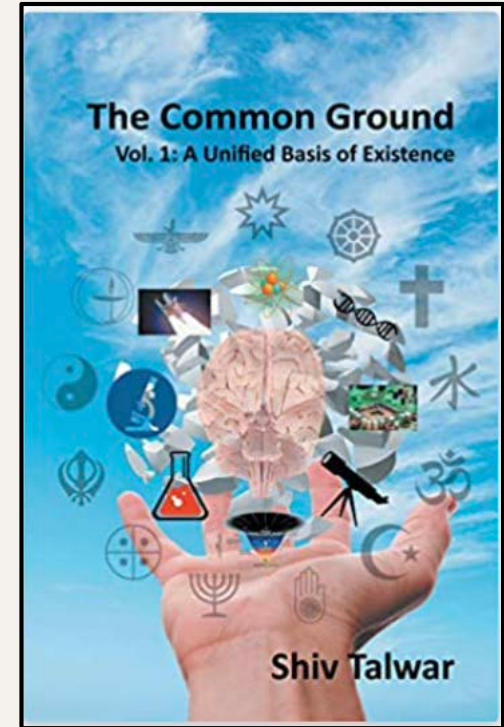




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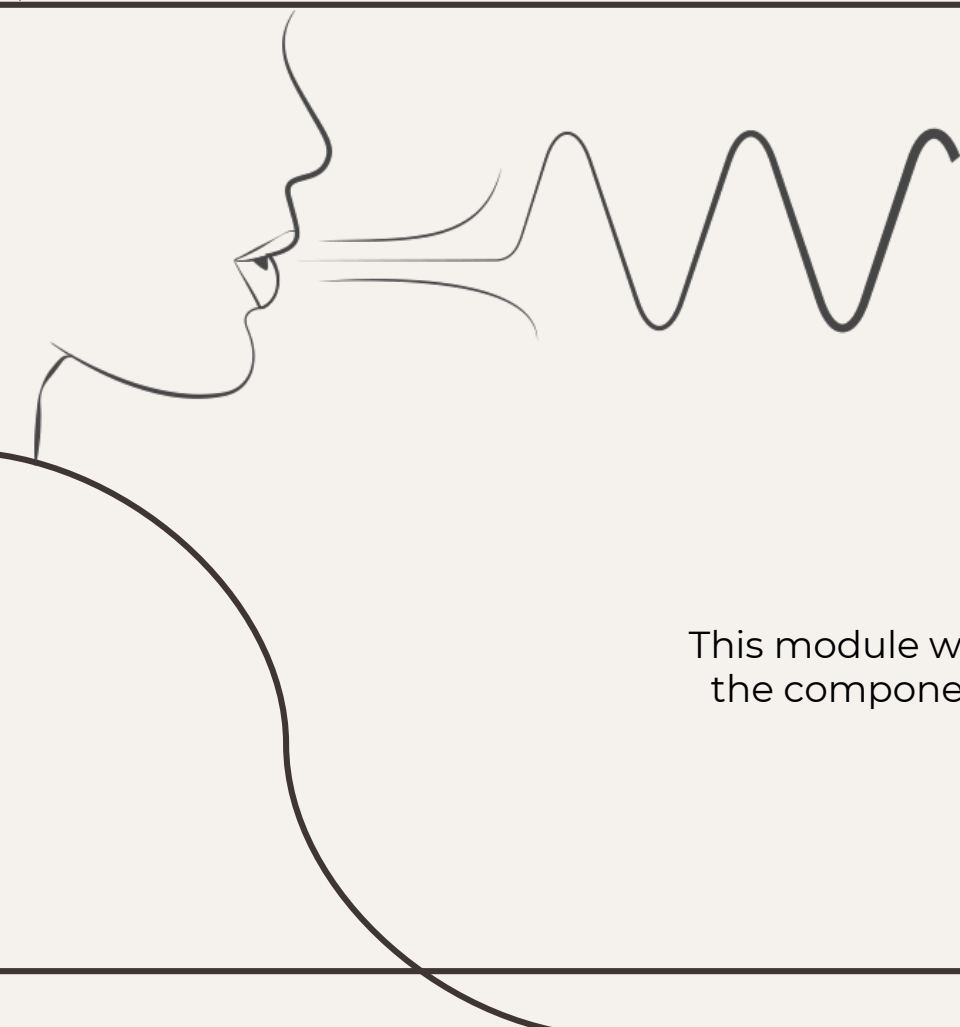
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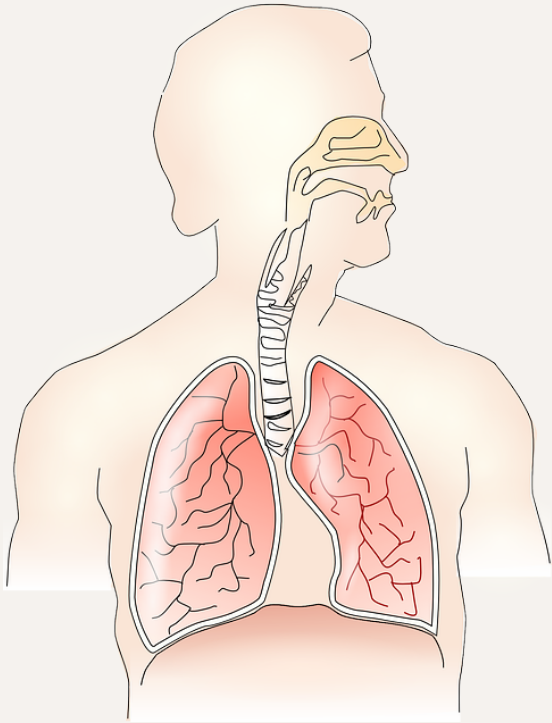


01

Anatomy of Breathing

This module will discuss the anatomical basis of breathing and the components that move every 5 seconds to keep us alive.

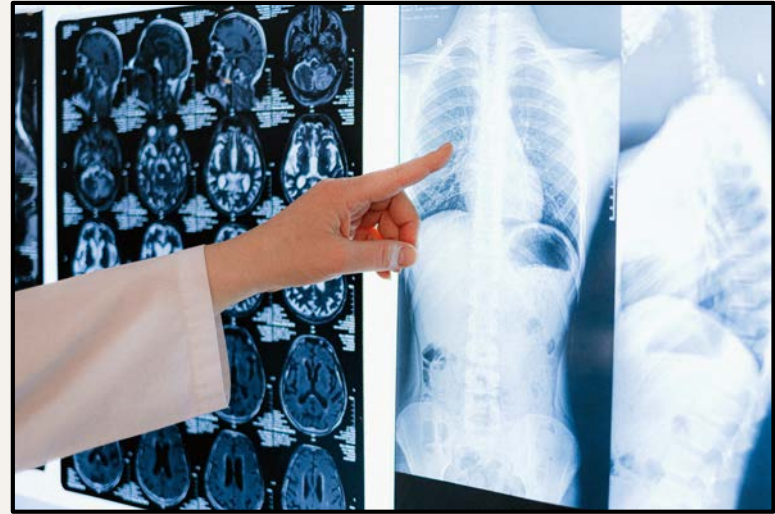
What is Breathing in the Medical World?



- Breathing is defined as the pulmonary ventilation which is the movement of air between the air and the alveoli in the lung
- 2 events: inspiration- air moves into lungs, and expiration- air leaves the lungs

What is Breathing in the Medical World?

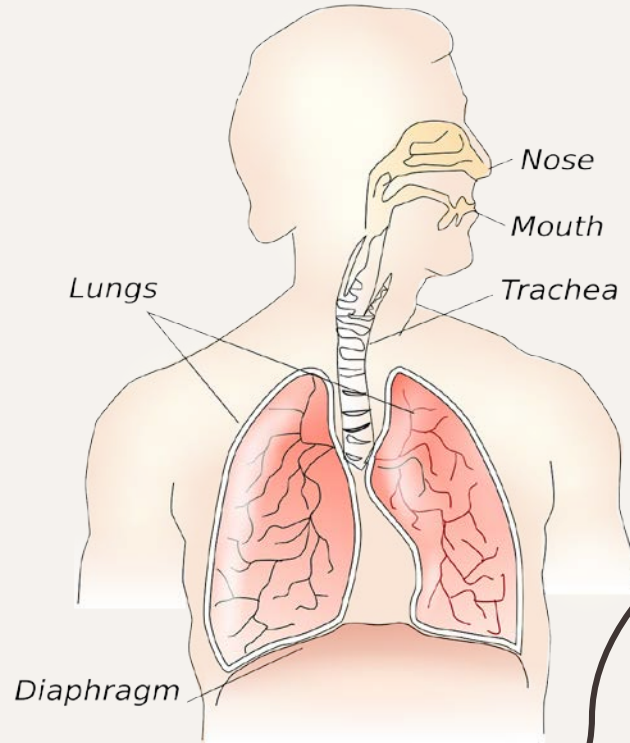
- The entire respiratory system is located inside the thoracic/chest cavity
- Thoracic cage encloses cavity, playing essential role in pulmonary ventilation
- Diaphragm and other muscles are also involved in ventilation process
- The action of breathing is controlled by the respiratory center, located in the brain stem



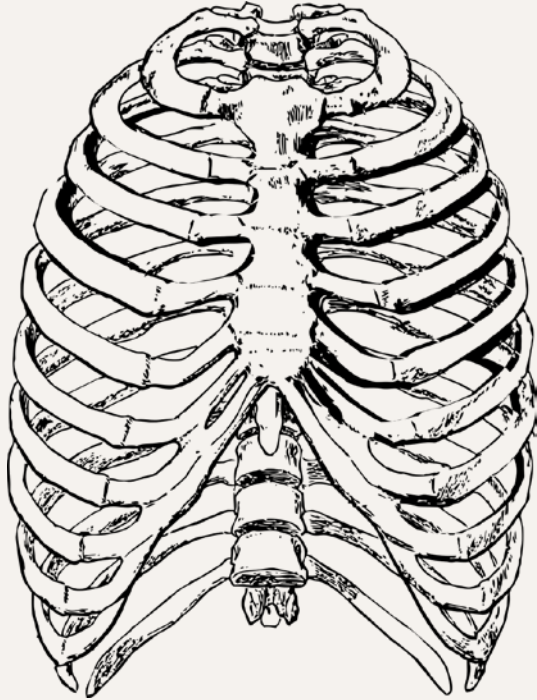
Thoracic Cage and Its Components

- Forms the bony framework for breathing
- Cages provides rigidity for organ protection, weight support for the upper limbs, and anchorage for muscles
- Dynamic due to ribs and joints; allows movement

Cage includes sternum, 12 pairs of ribs and 12 thoracic vertebrae



Ribs



- Floating ribs are attached at anterior ends by costal cartilages
- Costal cartilages gives thoracic wall the necessary elasticity
- Sternum forms the middle portion of the anterior thoracic cage
- All the components together offer protection and flexibility for ventilation



Muscles of Respiration

Thoracic Muscles

- Impossible to breathe without the action of the thoracic muscles, as they help expand and contract lungs
 - External intercostal muscles- raise the ribcage
 - Internal intercostal muscles- alter the anteroposterior dimension of the chest cavity
-



Muscles of Respiration

Neck Muscles

- Sternocleidomastoid and scalene muscles in the neck assist the thoracic muscles
- Sternocleidomastoid muscles- elevate the bones and lift the anterior ribs; accessory muscle in pulmonary ventilation
- Scalene muscles- contribute to elevation of first and second ribs; playing role in inspiration



Muscles of Respiration

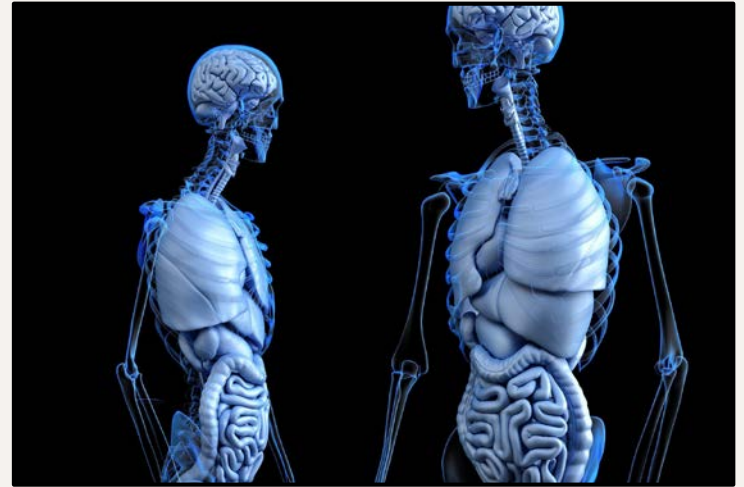
Pectoral Girdle Muscles

- Serratus anterior: overlies part of the thorax
- Its role is to work during laboured breathing- which is a type of respiration when the person is making an increased effort to breathe
- Ex. Grunting, wheezing, and nasal flaring

Muscles of Respiration

Abdominal Muscles

- Rectus abdominis helps in pulling the ribs down during active expiration
- Diaphragm helps in lengthening and shortening the chest cavity by moving up and down



Muscles of Respiration

Moving Muscles with the Conscious Mind

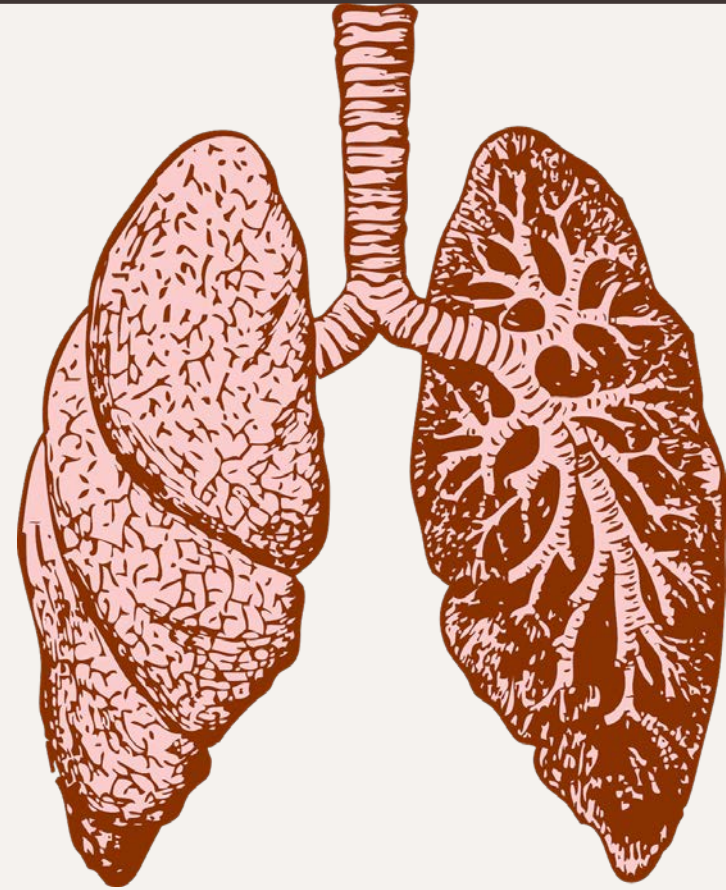


- Breathing is usually done passively, which makes all these muscles work without conscious thought
- We can work these muscles consciously when we begin to notice and regulate our breathing with our mind
- When breathing becomes conscious, we are able to utilize the entire respiratory system in a more efficient manner

Airways and Lungs

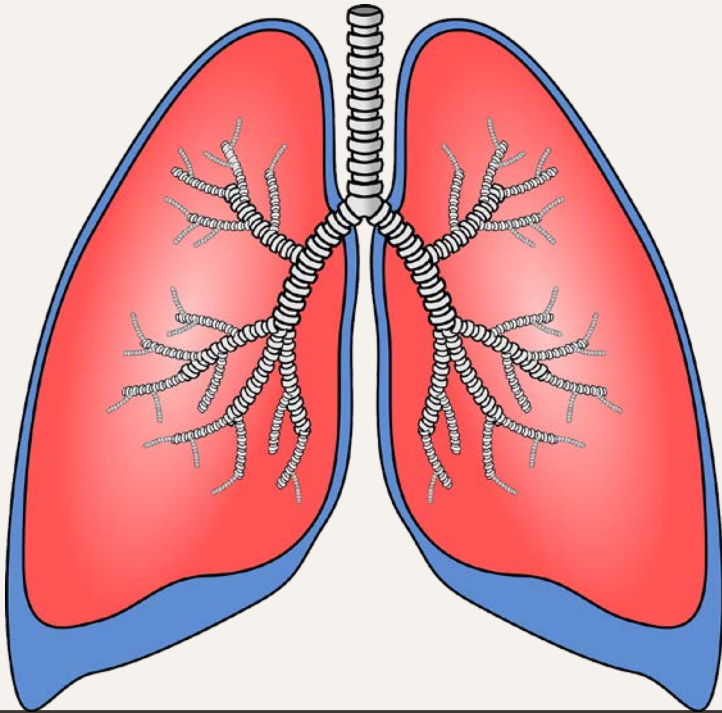
Conduction Airways

- Airways are subdivided into conduction airways (carry air in and out of the lungs) and respiratory zone (site of gas exchange)
- Cilia and mucus secreting cells filter, humidify, and warm the air
- The trachea divides into two main bronchi which go to each lung
- Bronchi divide into smaller bronchi, which is called the branches of the tracheobronchial tree



Airways and Lungs

Conduction Airways

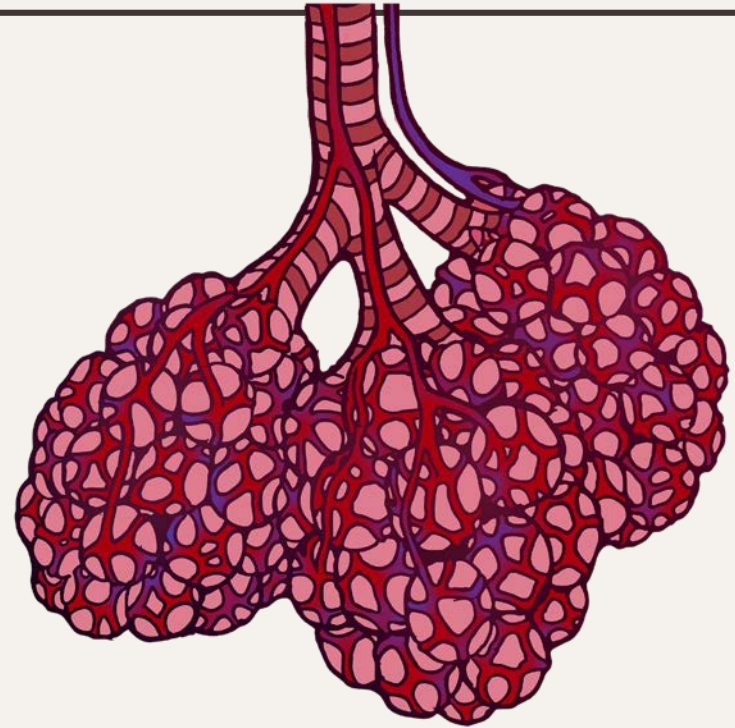


- Primary bronchi divide into lobar bronchi
- Lobar bronchi divide into segmental bronchi
- They will keep subdividing and branching, ending in respiratory bronchioles

Airways and Lungs

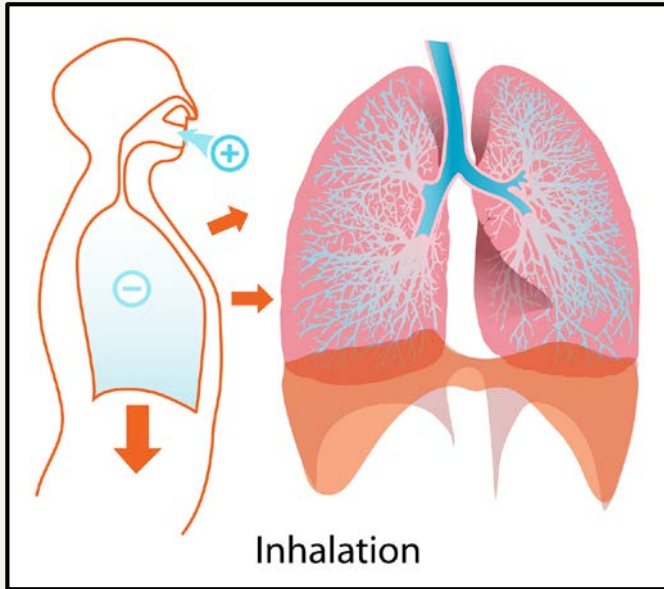
Respiratory Zone

- Lungs are responsible for the exchange of oxygen and carbon dioxide
- At the end of bronchial tubes, they are 480 million alveoli
- When you breathe in- alveoli expand to take in oxygen
- When you breathe out- the alveoli shrink to expel carbon dioxide



Breathing Mechanism

Inspiration

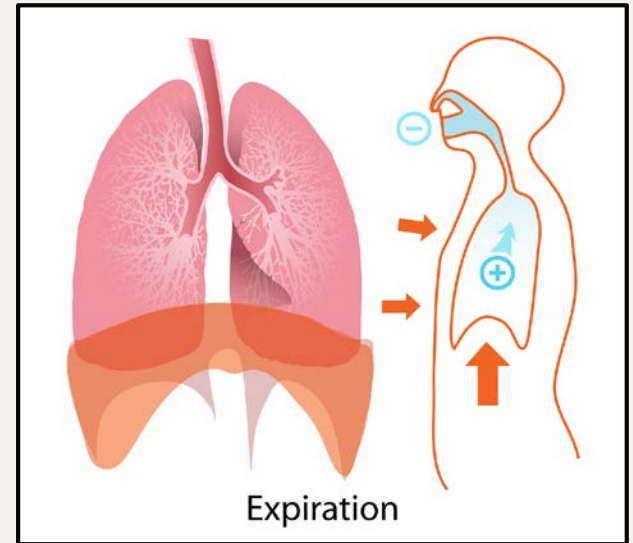


- Air entering the lungs from the external environment
- Diaphragm will contract and pull the surface of the lung down
- Muscles will elevate the rib cage; with these two actions we get increased intrathoracic volume
- When we need to breathe more deeply or forcefully, accessory muscles will increase cavity more by pulling sternum and first two ribs

Breathing Mechanism

Expiration

- External intercostals and the diaphragm will relax
- This will decrease the intrathoracic volume, which causes the air to be expelled from the lungs
- Average levels of oxygen are 95% or higher, but some people can have only 90% on an average basis
- Deep breathing can open up the airways and increase the amount of oxygen in the blood





Regulation of Breathing

The Connection with the Nervous System

- Breathing is controlled by the respiratory centre
- Dorsal respiratory group is responsible for the largest part of the breathing cycle
- Ventral respiratory group is responsible for forced expiration
- Pneumotaxic centre controls the rate and depth of breathing





Regulation of Breathing

The Connection with the Nervous System

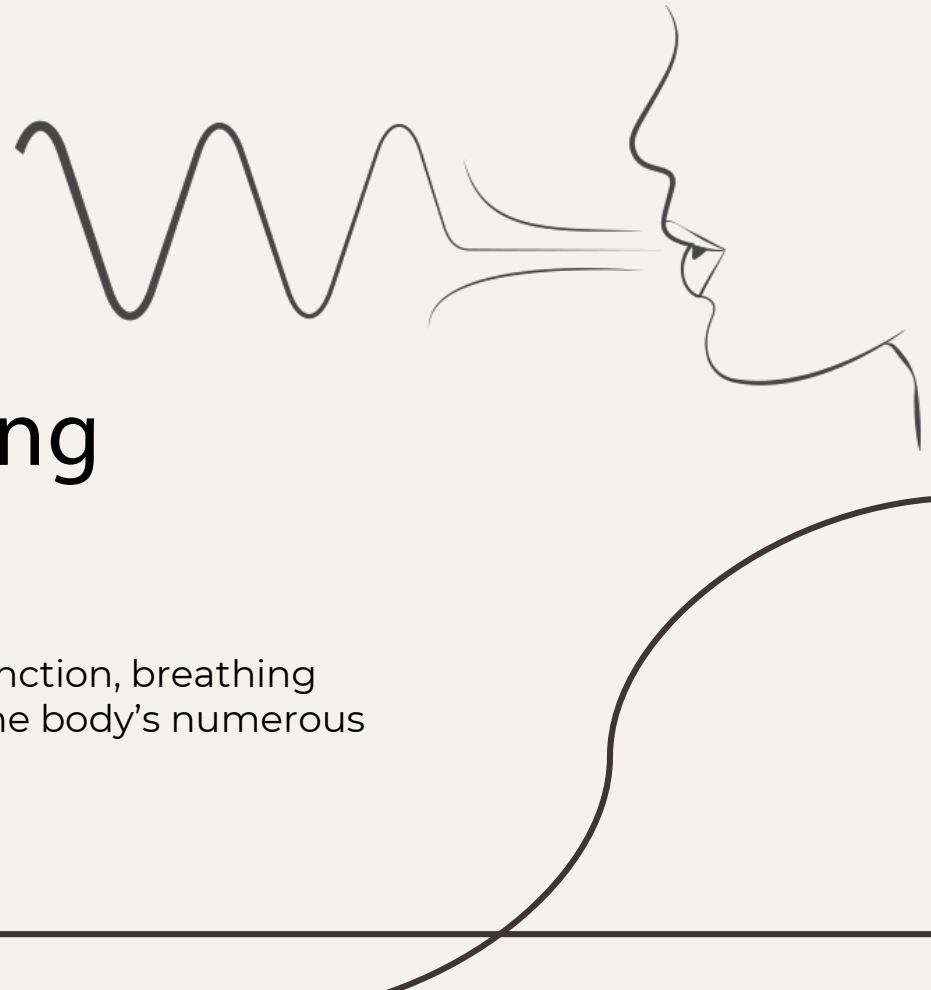
- To start the breathing cycle, the dorsal group will send an impulse towards the diaphragm, through intercostal nerves towards the external intercostal muscles
- When expiration needs to happen, the dorsal group stops the impulses which allows muscle relaxation



02

Physiology of Breathing

In this module we will discuss respiratory function, breathing mechanics, the association of breath with the body's numerous systems and the effects of stress.



The Respiratory system

- The lungs of an average 70-kg man have the alveolar gas-exchange surface area the size of a racquetball court.
- Compressing such a tremendous surface area into a comparatively tiny volume is indicative of how crucial it is for the body to receive adequate amounts of oxygen



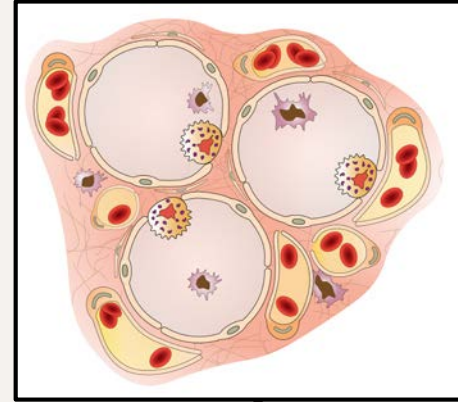
Primary functions of the Respiratory system

- 1. Exchange of gases between the atmosphere and the blood:**

The body takes in oxygen for distribution and expels waste carbon dioxide produced by metabolism.

- 2. Homeostatic regulation of body pH:**

By selectively storing or excreting carbon dioxide, the lungs can change the pH of the body.



Primary functions of the Respiratory system

3. **Protection from inhaled pathogens and irritating substances:**

The respiratory epithelium is well-equipped with defence mechanisms to catch and eliminate potentially dangerous compounds before they can enter the body.

4. **Vocalization:**

Vibrations produced by air passing through the vocal cords are employed in speech, singing, and other types of communication.



4 Main Processes of the Respiratory system

1. Gas exchange between atmosphere and lungs (ventilation)

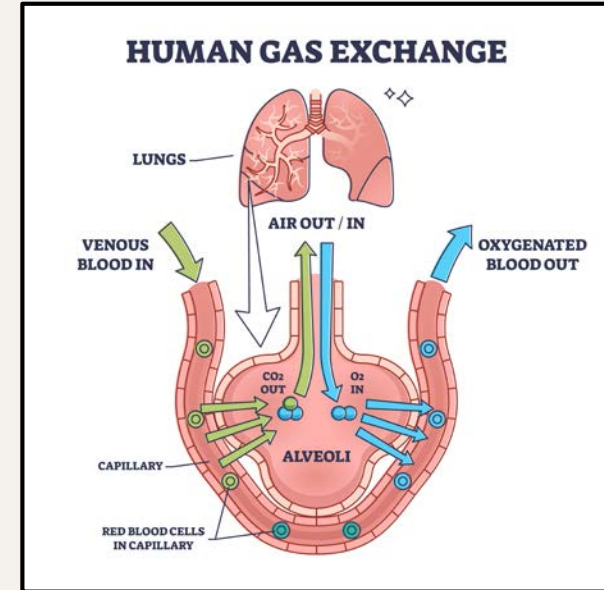
-Air moves into lungs: inspiration

-Air moves out of lungs: expiration

2. Gas exchange between lungs and blood (CO_2 & O_2)

3. Transport of gases by blood (CO_2 & O_2)

4. Exchange of gases between blood and tissues



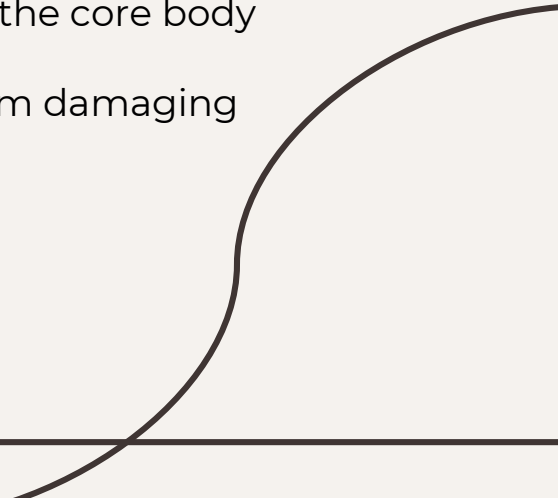


Ventilation

During ventilation, before air reaches the alveoli in the lungs it must be conditioned. Conditioning consists of three parts:

1. **Warming:**

Warming the air to body temperature (37 °C) prevents the core body temperature from fluctuating and prevents cold air from damaging the alveoli.





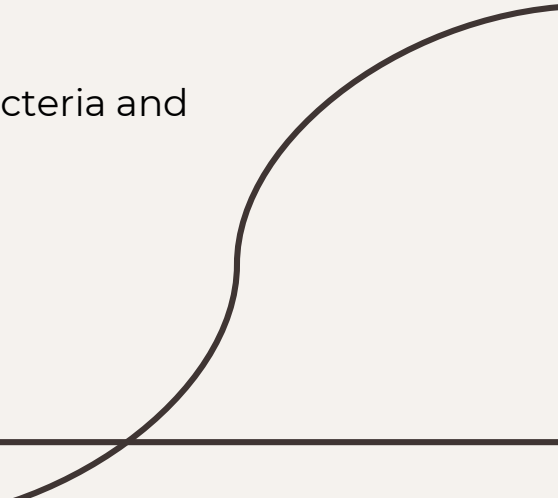
Ventilation

2. **Adding water vapour:**

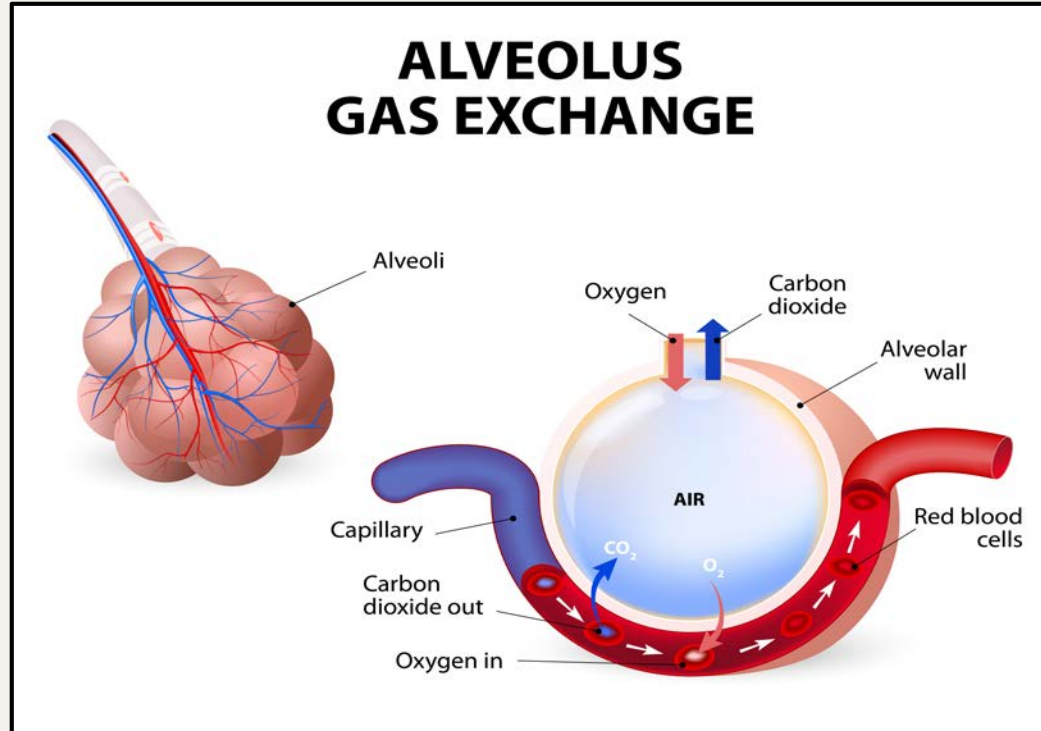
Adding water vapour until the air is completely humid also prevents the moist exchange epithelium from drying out.

3. **Filtering out foreign material:**

Finally, filtering out foreign objects prevents viruses, bacteria and inorganic particles from entering the alveoli.



Gas Exchange in the Lungs and Tissues





Lung Volumes

There are four measurable volumes of the lungs:

1. Tidal Volume (V_T)

- Volume of air moved in a single normal inspiration or expiration

2. Inspiratory Reserve Volume (IRV)

- Maximum amount of air that can be inspired above tidal volume

3. Expiratory Reserve Volume (ERV)

- Maximum amount of air that can be exhaled after normal expiration

4. Residual Volume (RV)

- Amount of air left in lungs after maximal expiration





Lung Capacity

The sum of two or more lung volumes is called a capacity.

- **Vital Capacity (VC)**

- An important measure of a person's respiratory health.
- It is the maximum amount of air that can be voluntarily moved into or out of the respiratory system.

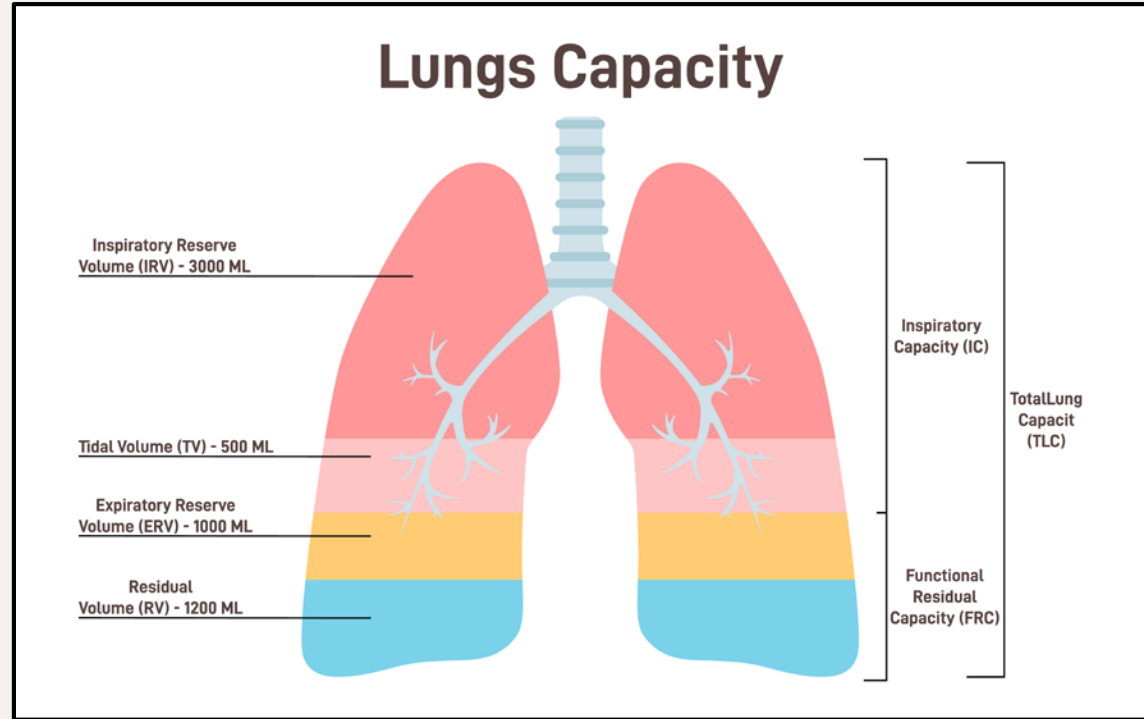
$$\mathbf{VC = IRV + ERV + V_T}$$

- Vital Capacity can be improved by diaphragmatic breathing

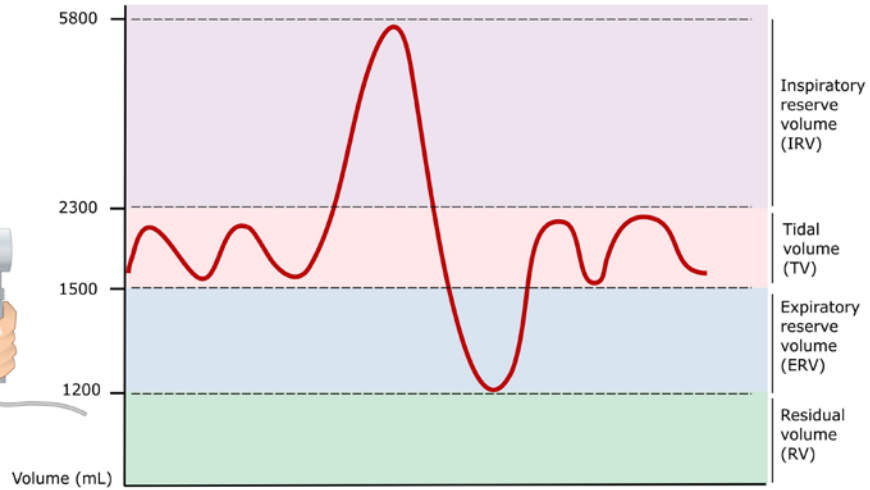
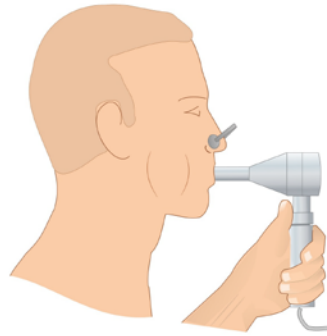
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5300812/>

Lung Capacity

- **Total Lung Capacity**
TLC = Vital Capacity + Residual volume



SPIROMETRY

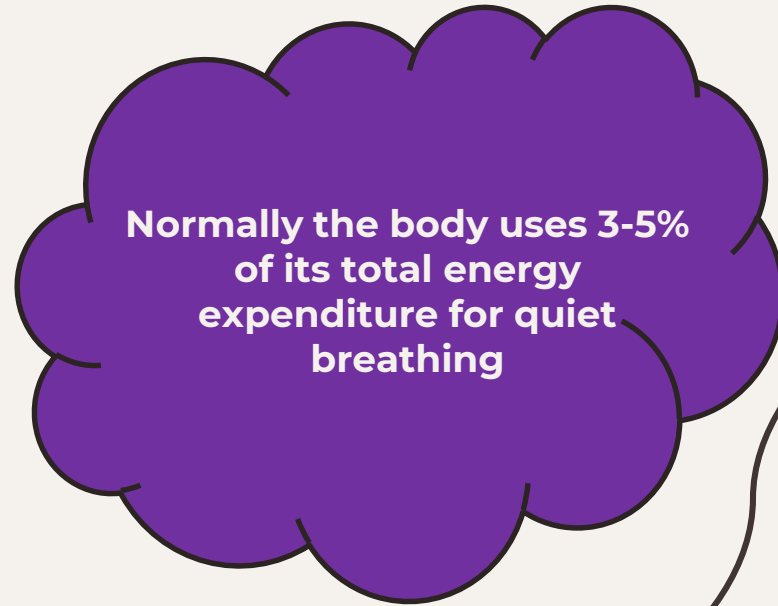


Male	Female
3000	1900
500	500
1100	700
1200	1100
5800 mL	4200 mL



Factors influencing breathing

1. **Lung Compliance**
2. **Lung Elastance**
3. **Airway Resistance**

A large, purple, cloud-like graphic with a black outline, containing text. A thin black line extends from the right side of the cloud towards the bottom right of the slide.

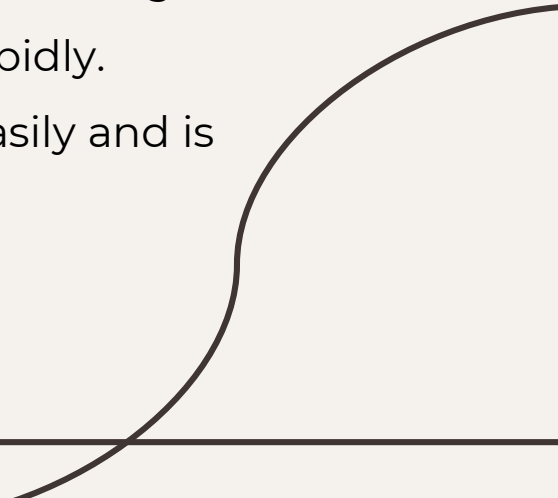
Normally the body uses 3-5%
of its total energy
expenditure for quiet
breathing



Factors influencing quiet breathing

1. Lung Compliance

- Magnitude of change in lung volume produced by a given change in pressure.
- The lower the lung compliance the harder it is to expand the lungs.
- People with low lung compliance breath shallowly and rapidly.
- High lung compliances indicates that the lungs stretch easily and is hence easier to breathe.

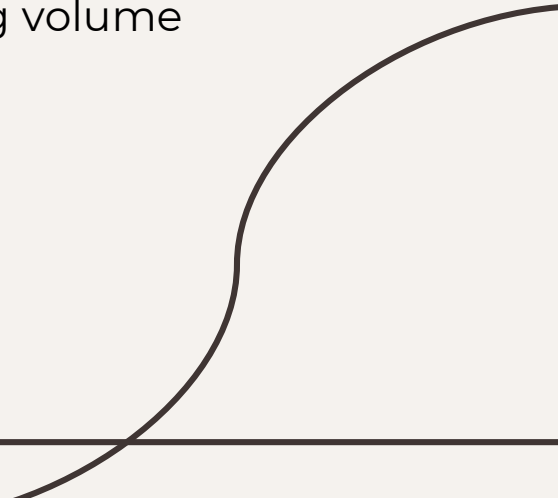




Factors influencing quiet breathing

2. Lung Elastance

- degree and/or speed of return to resting volume after lung is stretched.
- Low lung elastance means lung does not return to resting volume passively.
- Expiration must be forced actively, not passively.





Factors influencing quiet breathing

3. Airway Resistance

- Resistance is primarily determined by diameter of the airways.
- In normal circumstances, relatively low work is required for overcoming airway resistance than stretch resistance.
- Airway diameters are influenced by the parasympathetic nervous system, hormones and paracrine signals.





Bronchoconstriction & Bronchodilation

Bronchioles of the lungs are collapsible tubes and can become a source of airway resistance.

Bronchoconstriction

- Reduces the amount of fresh air that reaches the alveoli and increases resistance to air movement.

Bronchodilation

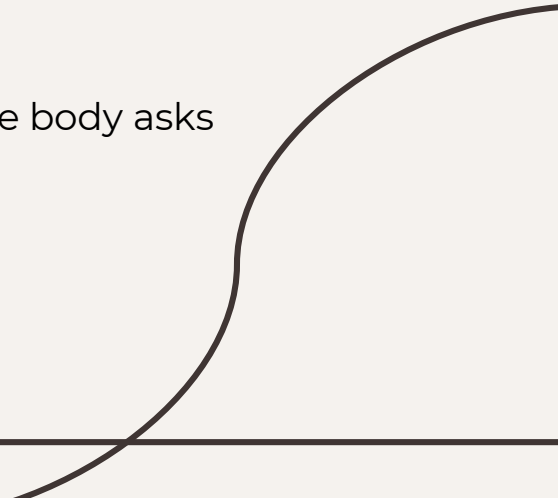
- Increases the amount of fresh air that reaches the alveoli and reduces resistance to air movement





Breathing & Paracrine signaling system

- Bronchiole width is largely controlled by the nervous system and hormones.
- But majority of minute-to-minute variations are controlled by paracrine signals.
- Carbon dioxide is the main paracrine chemical that influences bronchiolar width.
- **Bronchodilation** is caused by increased CO_2 in expired air, as the body asks for more oxygen.





Breathing & Paracrine signaling system

- Histamine has powerful **bronchoconstrictive** properties.
- Histamine is released to induce inflammation whenever tissue damage or an allergic reaction occurs.
- Large levels of histamine may cause excessive **bronchoconstriction** and breathing difficulties





Immune system

- An overactive immune system is the result of **sympathetic** dominance.
- The excess production of inflammatory molecules by the overactive immune system can be damaging to tissues and organs.
- Gives rise to autoimmune diseases (e.g., rheumatoid arthritis).
- It is proven that chronic, low-grade inflammation can become a silent killer that aggravates type 2 diabetes, cancer, cardiovascular disease, and other illnesses.

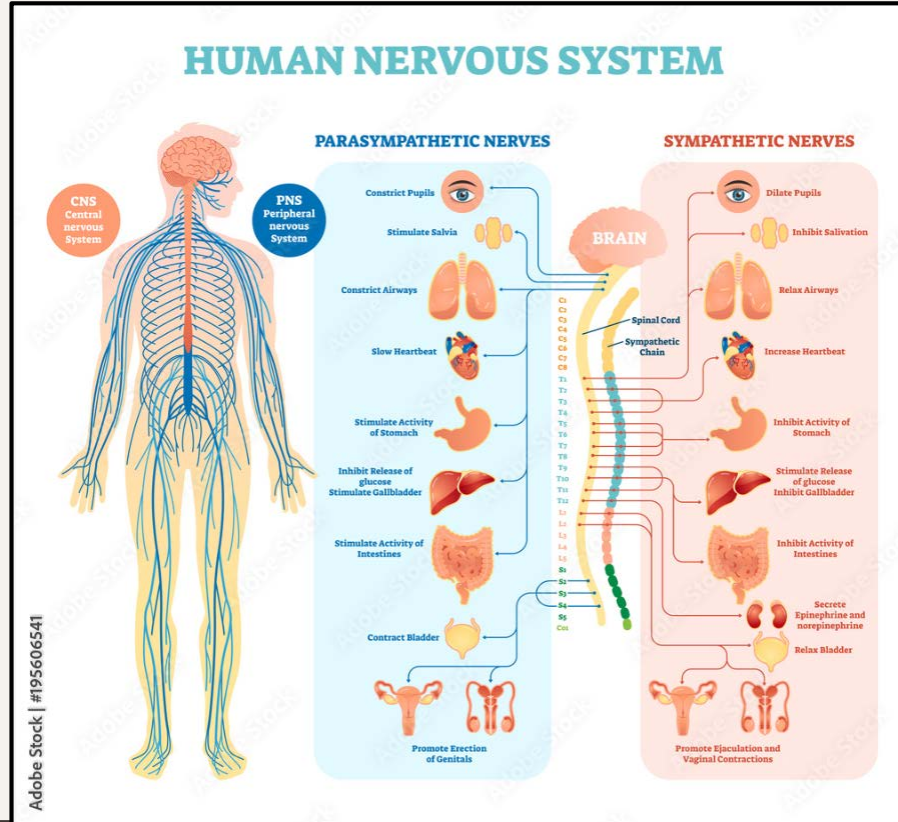


Stress & the Immune system

- The primary method to fix **sympathetic** dominance and correspondingly an overactive immune system is reducing **stress**.
- Stress is any change in the environment that requires your body to react and adjust in response. The body reacts to these changes with physical, mental, and emotional responses
- Stress affects all systems of the body including the musculoskeletal, respiratory, cardiovascular, endocrine, gastrointestinal, nervous, and reproductive systems



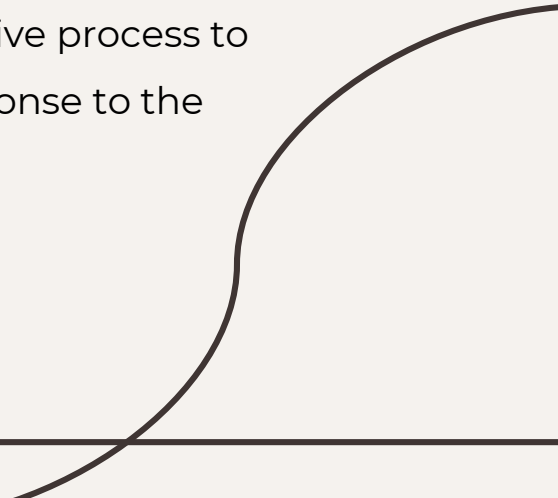
Stress & the Nervous system





Stress & the Nervous system

- Adrenalin (epinephrine) and cortisol are released by the adrenal glands in response to signals from the sympathetic nervous system.
- These hormones drive the heart to beat more quickly, the breathing rate to rise, the blood vessels in the arms and legs to widen, the digestive process to alter, and the blood glucose levels (sugar energy) to rise in response to the emergency.





Stress & the Nervous system

- In order to prepare the body to react to an emergency scenario or acute stress—short term stressors—the sympathetic nervous system reaction is rather abrupt.
- The parasympathetic nervous system, which often has opposite effects to the sympathetic nervous system, aids in this recovery.
- The immune system, which can also regulate stress reactions, is strongly influenced by the interplay between the sympathetic and parasympathetic nervous systems.



Stress & the Nervous system

- Since the central nervous system controls the autonomic nervous system and is crucial in evaluating environments as potentially dangerous, it plays a significant role in inducing stress reactions.
- Chronic stress causes the body to experience wear and tear as the autonomic nervous system continues to create bodily reactions (for eg. Proinflammatory reactions).
- The effects of prolonged stress on the nervous system are less serious than the effects of ongoing nervous system activation on other body systems.

<https://www.apa.org/topics/stress/body>



Deep breathing, a built-in stress reliever

- Diaphragmatic or deep breathing is a popular treatment for stress as well as asthma, COPD, and anxiety.
- One way deep breathing tackles stress is by significantly lowering cortisol levels.
- Cortisol is the hormone released in excess when there is sympathetic dominance. Chronically elevated cortisol levels put you at risk of many health problems.
- Numerous studies have shown that by stimulating the parasympathetic nervous system, we can reduce cortisol levels and induce relaxation.

https://www.canr.msu.edu/news/understanding_cortisol_the_stress_hormone#:~:text=Deep%20breathing%20causes%20the%20vagus,provide%20a%20sense%20of%20calm.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5455070/>



03

Why Deep Breathing?

This module will discuss the importance of deep breathing, along with its benefits on our mind and body.



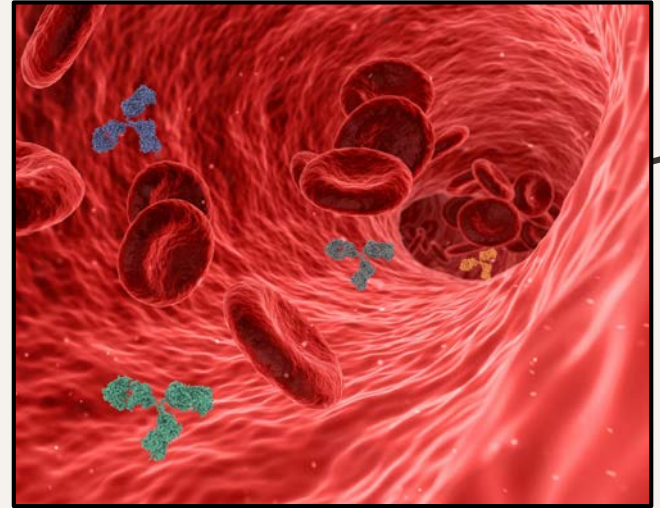
Purpose of Breathing

- Every part of our body needs oxygen to survive
- Most bodily processes produce the waste product of carbon dioxide, which needs to be removed
- Our lungs are working 24/7, 365 days a year
- We take around 6 million breaths a year
- 6 litres- average lung capacity
- 2000 gallons a day of air is breathed in by one person
- We only use 80% of lung capacity on average



Negative Effects of Quiet Breathing

- Quiet breathing has the risk of less oxygen being taken in and less carbon dioxide being released from the body
- If our body has high concentrations of carbon dioxide in the body, our blood pH can become acidic
- High levels of carbon dioxide can block the hemoglobin-oxygen binding process, which can potentially lead to asphyxiation



Oxygen Therapies

Hyperbaric Oxygen Therapy

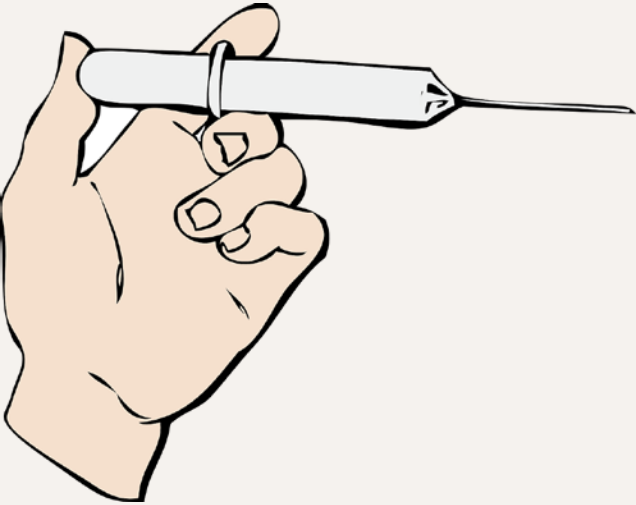
- Breathing pure oxygen in a pressurized environment
- Allows lungs to gather more oxygen
- The presence of more oxygen can fight bacteria and release growth factors and cells for healing
- However, it has potential risks like ear injuries, lung collapse, lowering of blood sugar to a dangerous level





Oxygen Therapies

Ozone Therapy



- Ozone is injected into the body in the form of an IV
- Used to treat medical conditions by stimulating the immune system
- Side effects and potential risks include nausea, light-headedness, Herxheimer reaction



What is Deep Breathing?

- Deep breathing is the use of your diaphragm correctly while breathing which will allow strengthening of the muscle, and use lungs to the full capacity
- Enables more air to flow into the body when you are breathing slower and more deeply from the stomach



Benefits of Deep Breathing



- Overcoming addictions
- Helping with mental illnesses
- Relieves pain
- Improves immunity
- Lowers blood pressure
- Corrects posture
- Detoxifies the body



Benefits of Deep Breathing

- Increases energy
- Improves digestion
- Focused mind
- Aids in improving concerns like cancer, diabetes, and autoimmune diseases





Overcoming our Genetic History

- Cleansing our body and removing toxins and diseases, we will improve our genetic history for our generations to come
- Changing the phenotype of the diseases we have, will change the genotype, which will be inherited by our future generations





Impact from Conception

- The benefits of deep breathing can start from the moment of conception
- As a pregnant woman does deep breathing, the effects will be on the developing child
- Beneficial for the pregnant woman as well, as it can reduce prenatal stress and other issues



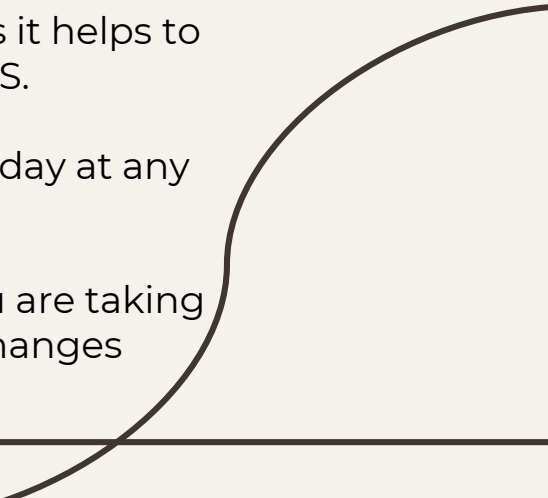


04

How Do We Do Deep Breathing?

This module will go through the steps of deep breathing, along with videos for aid.

How to Breathe Deep

1. Find a quiet, comfortable place to sit or lie down.
 2. Take a normal breath. Then, try a deep breath by breathing in slowly through your nose and allowing your chest and lower belly to rise as you fill your lungs. Let your abdomen fully expand before breathing out slowly through your nose.
 3. Control your breath from start to finish and keep count of it as it helps to maintain focus. **AVOID HOLDING YOUR BREATH AT ALL TIMES.**
 4. Keep practicing. Breathe deeply for at least 20 minutes every day at any time that is convenient for you.
 5. Track your progress. Keep notes of the number of breaths you are taking per minute as well as write about your physical and mental changes after your deep breathing practice.
- 



Deep Breathing App

<https://cclr.spiritualeducation.org/sites/allfiles/cclr/files/Lessons/LearnDB/index.html>

Click on the picture →





Yogic Deep Breathing Video

<https://www.youtube.com/watch?v=CARo8Vj08uA>



Click on the picture



Incorporating Deep Breathing into Your Schedule

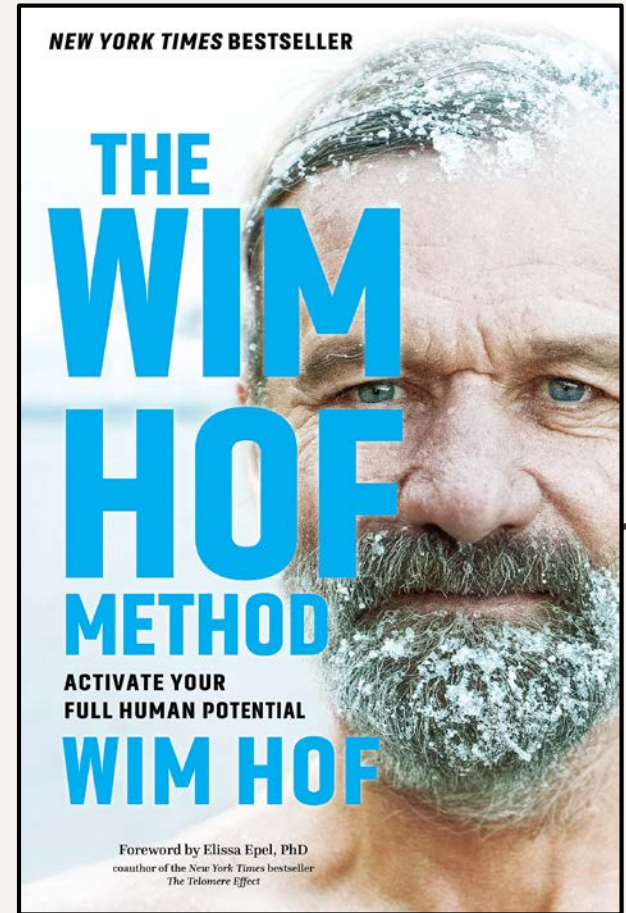
- Schedule time for deep breathing everyday, incorporate into your daily life
- Doing it in the morning is a good way to start the day
- Deep breathing before bed can also be a good part to add to a bedtime routine
- Start with a 10 min routine, working way up to 15-20 mins
- Once you become more experienced, you will be able to do deep breathing anywhere and anytime (during the workday, while driving or while watching TV)
- Incorporate your family and kids whenever possible



The Wim Hof Method- activate your full human potential

The author Wim Hof, also known as “The Iceman” shares his story of his amazing capabilities and the methods he uses daily. He utilizes unique practices to change the bodies chemistry and abilities. He goes into detail about each method along with ways to make sure you are safe. With his method, there have been many successful stories of overcoming diseases like breast cancer, sclerosis and colitis. His methods have been tested in many research labs and he goes into detail about each finding.

<https://www.amazon.ca/Wim-Hof-Method-Activate-Potential/dp/1683644093>



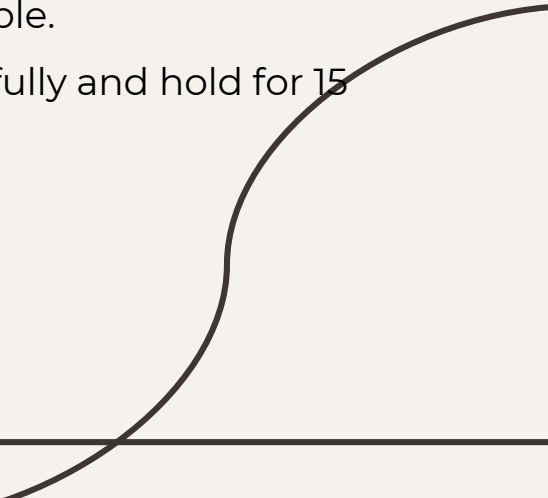


The Wim Hof Method

- The Wim Hof method combines 3 things; breathing, cold therapy, and commitment
- Controlled hyperventilation in 3 sets of 30 breaths
- Partaking in cold showers to release natural endocannabinoids which can help increase energy and lessen anxiety



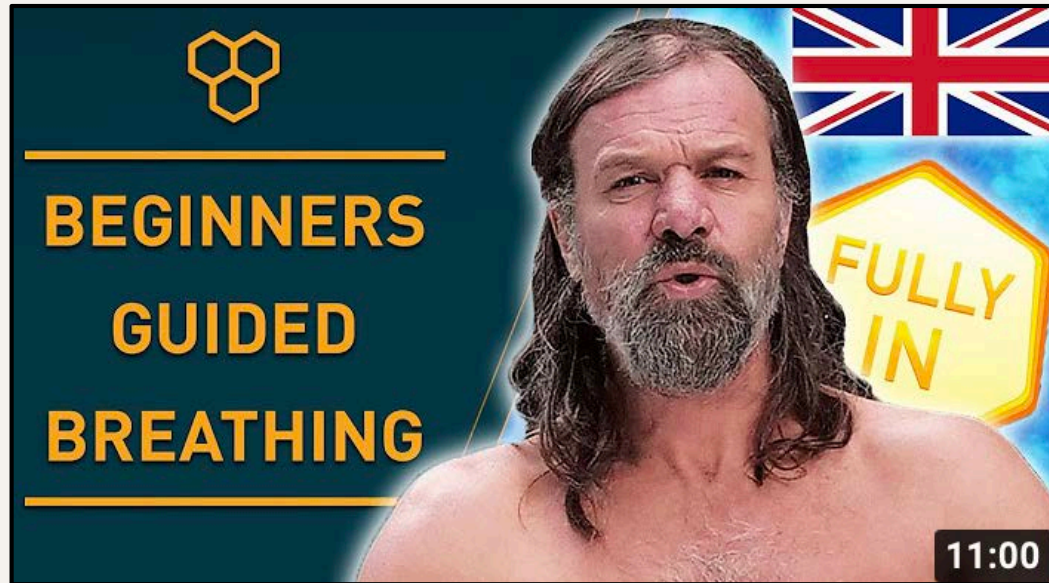
How to do the Wim Hof Method-Breathing

1. Take in a strong inhalation through the nose.
 2. Let out a relaxed exhalation through the mouth.
 3. Repeat for 30 breaths.
 4. On the 30th breath, exhale and hold for as long as possible.
 5. When your body feels the need to take a breath, inhale fully and hold for 15 seconds before releasing.
 6. Repeat these steps 2 more times, for a total of 3 rounds.
- 

The Wim Hof Method Video

<https://www.youtube.com/watch?v=0BNejY1e9ik>

Click on the
picture →



How to do the Wim Hof Method-Cold Therapy

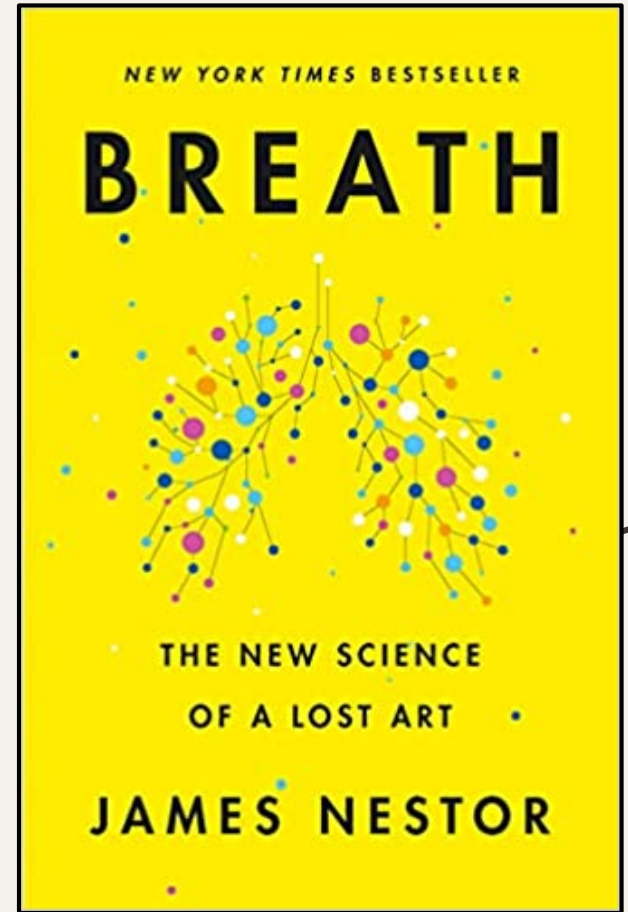
1. Start with adding 10 seconds of cold water to the end of each shower
 2. Focus and control your breath
 3. Each week, try to increase the amount of time by 10 secs
- Try cold water swimming and increase the amount of time spent in cold water to as much as possible
 - Work your way up to doing full cold showers



Breath: The New Science of a Lost Art

James Nestor discusses the importance of breathing properly as nothing is more essential to our health and well-being. He talks about ancient breathing practices like Pranayama and Tummo and conducts research on those beliefs. This book tells the reader about the connection of breath and mind and gives ideas and methods on how to breathe better. Using history and modern techniques, James presents a new perspective to the process of deep breathing. Scientific studies and research allow one to see the physiology and education behind these methods.

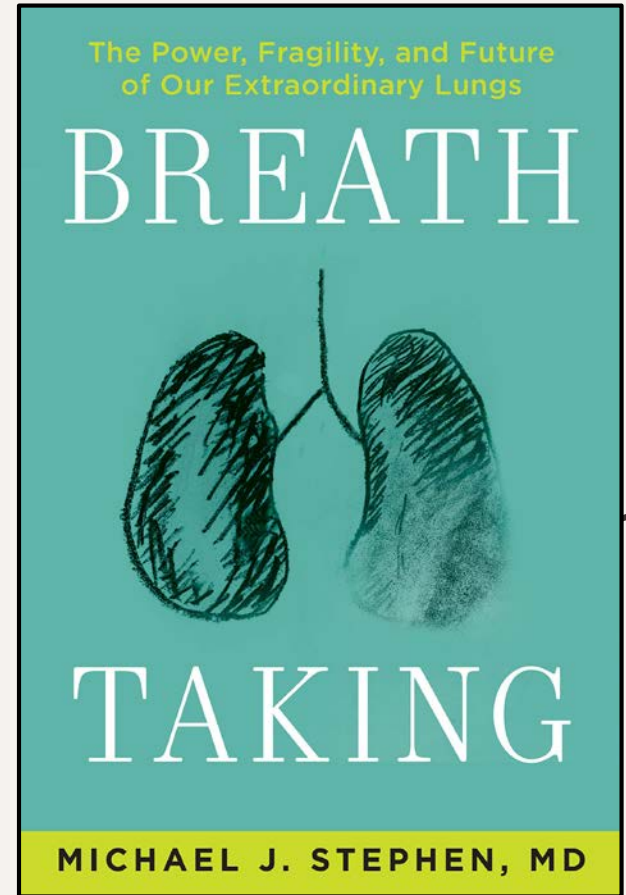
<https://www.amazon.ca/Breath-New-Science-Lost-Art/dp/0735213615>



Breath Taking: The Power, Fragility, and Future of Our Extraordinary Lungs

Michael Stephen is a pulmonologist that brings the medical perspective to the topic of lungs and breath. By discussing the history of oxygen on Earth and origins of breathing, he explains the power of breath to heal the body. As this is a recent book, he mentions the pandemic and its relatedness for making our lungs vulnerable to disease.

<https://www.amazon.ca/Breath-Taking-Fragility-Future-Extraordinary/dp/0802149316>



Conclusion

- Breath is essential to life, but taking the right breaths can make our life better
- With every breath, there are a series of muscles and organs that work together to ensure we are getting the required oxygen and removing waste
- Our lungs have so much more capacity than we use on a typical basis
- Use your lungs to their full capacity and make a conscious effort to better your life
- Incorporate deep breathing as much as you can into your life, and see the benefits for yourself



Thanks

Do you have any questions?

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