Breathing: The Fundamentals

"Breathing is the most readily available resource you have for creating and sustaining your vital energy" Donna Farhi

The body knows how to breathe – it happens without us having to think about it. Every moment of the day the breath flows in and the breath flows out, sustaining us – nourishing us with each fresh inhale, and cleansing us with each new exhale.

Watch a new-born baby or cat sleeping and you will see this wonderful exchange in motion – the whole body appears to move with the flow of the breath. Each breath is a miracle in motion.

Yet when you see a new student come to a yoga class the breath is often imperceptible or appears shallow – the body barely moving. Stress, tension and the rapid pace of our modern lives has taken its toll, particularly if that stress is chronic and experienced over months, years or a lifetime. Add to this the effects of modern living (smoking, pollution, poor posture arising from a sedentary lifestyle) and we can begin to restrict the full potential of the breath.

While the breath is a subconscious act that takes place without effort or thought on our part, it is also one of the automatic processes within the body that we can influence and regulate with awareness and practice. We are able to make the unconscious, conscious.

With awareness and the nurturing support of our yoga practice, we tap into the true expansive nature of our breath, and as Donna Farhi reassures us "in reclaiming the fullness of our breathing we can also reclaim many other dimensions of our lives".

Check out the poem "The Anatomy of Peace" by John Roedel on page 5 of this handout, which expresses this beautifully.

How the breath supports us…

The breath:

- Nourishes us, bringing in fresh oxygen
- Cleanses us, removing carbon dioxide
- Connects us to the present moment.
- Helps us to feel grounded
- Generates clarity and focus
- Brings calm amidst chaos
- Helps us feel expansive and open

"The breath holds the body and mind together" Rolf Sovik

You may have experienced yourself the benefits of healthy and natural breathing after a yoga class – after all, the most useful measure of all is how we feel. But what does science say to support that which we know through our own experience?

There are many examples of research and clinical trials which show the impact of breathing exercises on our health:

Effect of mind-body interventions, including yoga and breathing exercises, on wellbeing

The physiological effects of slow breathing in the healthy human

The effect of yoga on respiratory functions, symptom control and life quality of asthma patients, Department of Internal Health Medicine, Ataturk University, Turkey

Effect of yoga breathing on exercise tolerance in patients with COPD, University of Vermont

And in a small study that I conducted with staff at an NHS mental health Trust, those who took part in a 15 minute "Breathing Space" session (breath awareness and relaxation) reported a 50% reduction in perceived stress levels.

"The breath is always there…always the potential teacher
and provides us with an ever-present 'yoga mat'" Judith Hanson-Lasater

The Mechanics of the Breath

i) The Respiratory System

The respiratory system provides the structures within the body that allow us to breathe, supplying the cells of the body with oxygen and removing the waste product – carbon dioxide. It fulfils this function along with the circulatory system, nervous system and muscular system.

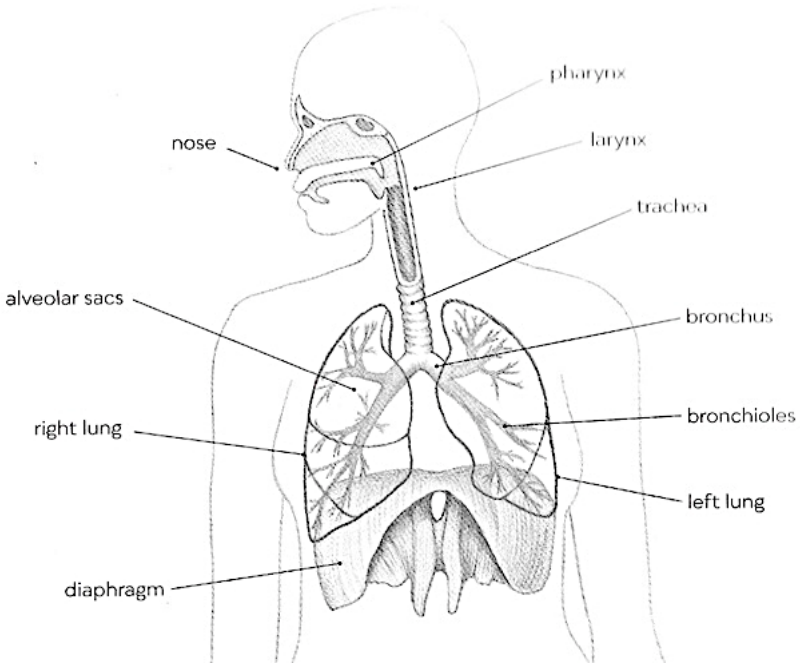

Image credit: Yoga Myths, Judith Hanson Lasater

(Also see page 30 in The Science of Yoga for a diagram of the respiratory system).

The respiratory system is divided into 2 main parts: upper respiratory tract and lower respiratory tract.

Upper Respiratory Tract:

- Nose & nasal cavity: filters dust and air particles, and warms and moistens the air
- Pharynx (throat): carries air and from the nose, and food/fluids from the mouth
- Larynx (voice box): involved in producing speech

The epiglottis, a flap of cartilage, covers the larynx during swallowing to keep food and liquids from entering the rest of the airways.

Lower Respiratory Tract:

- Trachea (windpipe): carries air to and from the lungs
- Bronchi: two large branches from the trachea, each one leading into a lung
- Lungs: the organs of the body where gas exchange takes place
- Bronchioles: the bronchi subdivide into these small, branching tubes
- Alveoli: clusters of tiny air sacs

ii) The Muscles of Breathing

As the lungs aren't made of muscles tissue, they depend on the action of muscles to draw air in and push air out. These muscles are classified into two groups; Primary and Accessory (also referred to as secondary).

Primary muscles of breathing:

i) Diaphragm: the main muscle involved in breathing, responsible for around 75% of respiratory effort. A dome shaped muscle (likened to a parachute or opened umbrella) that divides the chest and the abdomen, with openings to allow the oesophagus (food tube) nerves and major blood vessels to pass through.

The diaphragm is connected to the sternum at the front of the chest, the ribs, and the first 3 lumbar vertebrae in the lower back. So, you can see how our posture can affect our breathing; if the spine is rounded and the chest slumped or if the lower back is excessively rounded or 'tucked' our natural movement of the diaphragm and breath will be impeded.

The top of this dome shaped muscle is slightly flattened to make room for the heart, which is connected to the diaphragm by connective tissue (fascia).

Movement of the diaphragm is controlled by the phrenic nerve, which runs from the neck to the diaphragm.

ii) Intercostal muscles: the muscles between the ribs. There are internal and external intercostal muscles. These are sometimes classified as accessory muscles of breathing.

Accessory (secondary) muscles of breathing:
These muscles assist in moving the ribs, collarbones and sternum (can you find them in the Science of Yoga book – page numbers have been given as a clue!)

Abdominal muscles (P18, P156)
SCM (sternocleidomastoid) – runs from behind the ear to the collarbone/sternum (P57, P98)
Scalenes – thin muscle in the front of the neck, helps to move the 2 upper ribs (not shown)
Pectorals – front of the chest (P18)
Upper trapezius – runs from the base of the skull to the top of the shoulder blades (P19, P112)
Serratus anterior – runs from the surface of the upper ribs to the shoulder blade (P69, P76)
Pelvic floor muscles (P153)

iii) How we breathe

When we inhale:

- The diaphragm contracts and lowers
- Abdominal organs are pressed down and outwards
- Intercostal muscles move the ribcage upwards and outwards
- Greater space is created in the lungs, which lowers air pressure
- Air flows into the lungs to balance the air pressures between the body and the atmosphere.

When we exhale:

- The diaphragm relaxes and rises
- Intercostal muscles pull the ribcage down and inwards
- Space in the lungs decreases, which increases air pressure
- Air is pushed out of the lungs

This animation helps to visualise the movement of the primary muscles, the rib cage and lungs (click here)

Gas Exchange:

When oxygen reaches the end of the airways in the lungs, it passes via the alveoli into the bloodstream where it is transported around the body and used by the cells to release energy. Carbon dioxide is a waste product of this process, and is carried through the bloodstream and released back through the alveoli into the lungs – being released back into the atmosphere on the exhale.

A FEW FASCINATING FACTS

- Structures in the nasal cavity known as turbinates or conchae, secrete up to 2 pints of fluid a day – helping to moisten the air that we breathe before it's transported to the lungs.
- The right lung is divided into 3 lobes, whereas the left lung is divided into 2 lobes – creating room for the heart.
- There are about 300 million alveoli in the lungs (some sources state 600 million)!
- Up to 60% of our lung tissue is towards the back of the body (the heart shares the space towards the front of the body). Do you feel the breath moving at the back of the ribcage?
- As the diaphragm moves, this causes the organs in the abdominal cavity to move. For example, the kidneys move up and down 5cm with each breath. If you breath the

average or 20,000 breaths a day, the accumulated distance that the kidneys move is about ½ km a day! (source: Tom Myers).

It is essential that the diaphragm can move freely and without restriction so that we can breathe easily and utilise the full potential of the breath. The function of the diaphragm can be affected by our posture, habits and breathing patterns, stress and certain medical conditions (e.g. hiatal hernia). The health and condition of all other parts of our respiratory system will also affect our breathing capacity, and yoga has a great part to play in keeping our respiratory system happy and healthy.

It's useful to have some basic knowledge of the anatomy of breathing so that we understand our body, how we breathe and what might affect the capacity and effectiveness of our breath. But the most important thing is that we embody this understanding and awareness – that we experience and feel the breath and the body in union. Through doing so we begin to identify patterns and habits and take simple steps to reconnect to the natural and full potential of the breath, and thereby the full potential of the body and mind.

A useful note:

When you explore any breathing practices, whether that's simple breath awareness or more complex techniques, allow your practice to be gentle and softly unfold. If we try to force our efforts with steely concentration and determination, we only bring further tension into the body and mind which will have the opposite effect to the one which we hoped for.

The intent however should be to allow the body and mind to open and soften. Explore the felt-sense with gentle curiosity; how do I feel, what do I notice. Allow the breath to gently take you by the hand and lead you.

"May each breath be like a footstep bringing you back to the home of yourself"
William Wordsworth

The Anatomy of Peace, John Roedel
(or watch a video reading on John Roedel's website here)

My brain and heart divorced a decade ago
over who was to blame about how big of a mess I have become
Eventually, they couldn't be in the same room with each other

Now my head and heart share custody of me
I stay with my brain during the week
and my heart gets me on weekends

they never speak to one another
- instead, they give me the same note to pass to each other every week
and their notes they send to one another always says the same thing:
"This is all your fault"

On Sundays my heart complains about how my head has let me down in the past
and on Wednesdays my head lists all of the times my heart has screwed things up for me in the future

They blame each other for the state of my life
there's been a lot of yelling - and crying

So,
Lately, I've been spending a lot of time with my gut
who serves as my unofficial therapist

Most nights, I sneak out of the window in my ribcage
and slide down my spine and collapse on my gut's plush leather chair that's always open for me

~ and I just sit sit sit sit until the sun comes up

Last evening, my gut asked me if I was having a hard time being caught between my heart and my head

I nodded
I said I didn't know if I could live with either of them anymore

"My heart is always sad about something that happened yesterday while my head is always worried about something that may happen tomorrow," I lamented

My gut squeezed my hand

"I just can't live with my mistakes of the past or my anxiety about the future," I sighed

My gut smiled and said:
"In that case, you should go stay with your lungs for a while,"

I was confused - the look on my face gave it away

"If you are exhausted about your heart's obsession with the fixed past and your mind's focus on the uncertain future your lungs are the perfect place for you

There is no yesterday in your lungs there is no tomorrow there either
there is only now there is only inhale there is only exhale there is only this moment
there is only breath

and in that breath you can rest while your heart and head work their relationship out."

This morning, while my brain was busy reading tea leaves
and while my heart was staring at old photographs
I packed a little bag and walked to the door of my lungs

Before I could even knock she opened the door with a smile and as a gust of air embraced me she said

"What took you so long?"

(johnroedel.com)