

Breathing In, Breathing Out...

Breathing is absolutely fundamental to our being. We can survive for perhaps 3 months without food. About 10 days without water. And, for virtually everyone, after 6 minutes without breath, we are dead. The feeling of not being able to breathe causes deep primal anxiety. Our first act at birth could be said to be an inhale. And we die on an exhale. This breath is a great teacher. It teaches us about life, about presence – and about how to live.

How we are breathing is essential to our health. The truth is that many of us, without knowing it, breathe in ways that are damaging to our well-being. Essential elements that influence breathing include our mental states; our diaphragm (that body muscle which is the vital engine of our breathing and moves both automatically and can be consciously controlled); our lifestyle (including diet, posture and movement); our phrenic nerve (the most important nerve of the sympathetic nervous system which could be called ‘the breathing nerve’); and our medulla (a part of the brainstem which regulates respiration).

This subject of breathing has inspired different theories, different techniques and different therapies. Some share significant similarities; some have considerable conflict of opinion. People with PhDs have dedicated themselves to studying the breath; as have people with decades of personal practice experience. A good question is what are the aims: spiritual enlightenment or physical fitness or good health or long life (or a combination of these four; or something else altogether)?

The Importance of Breathing

Right from the start of teaching yoga in 2001, I emphasised the importance of breathing during practice by using phrases such as “the breath is the platform for postures”; “breathing is a beautiful barometer for the body”; “too often when practising yoga, the breathing is sacrificed for the supposed success of a shape”. Yoga teachers have to say the word ‘breathe’ a lot! One criterion for teaching yoga could be the ability to talk about breath without getting bored...

But though in my teaching I was using these words – breath, breathe, breathing – and those phrases, in my own practice I certainly sacrificed breath at times on the altar of posture. For example, when I was straining to accomplish *Marichyasana D* or *Pasasana* my breath was probably about as rapid as a rabbit on the run. And in the early days of my yoga practice, my breathing sounded like a bad-tempered steam engine. In some Ashtanga yoga circles in the 1990s, that was the way to breathe: forcefully with strong sound.

My own ‘natural’ breathing is fast. I am an impatient person and, for a long time was striving to achieve in my postural practice. My exhale is normally longer than my inhale. I remember an Ashtanga teacher in the mid-2000s giving me this advice: “lengthen your inhale”. This is an illustration of teaching based on individual situations because, in many cases, impatience is actually often associated with the inhale being longer. But at least I was breathing through my nose and trying to practise what is called “slow breath with pleasant sound” (also known as *ujjayi* breath or the cat’s purr breath).

In 2012, Ben Wolff introduced me to coherent breathing – an even balance of inhale and exhale with each being 6 seconds long (so 5 breaths (inhale & exhale) per minute). I was resistant and experienced

aversion. Maybe because my normal rate of breathing was substantially quicker than that. Maybe because I can have an instinctive resistance to being told what to do!

Over the next few years, I studied with Ben and learnt from him how this way of breathing is believed to be optimal for our health. By 2018 (six years after I first heard about this practice), I had become a convert and I was doing the 6/6 breathing in my practice and in my teaching. In 2019, I spent seven days coherently breathing when studying with Richard Brown and Patricia Gerbarg, the authors of the excellent *The Healing Power of the Breath: Simple Techniques to Reduce Stress and Anxiety, Enhance Concentration, and Balance Your Emotions* (Shambhala, 2012).

The New Science of a Lost Art

It was Ben who told me about James Nestor and his book, *Breath: The New Science of a Lost Art* (Penguin Life, 2020). It is important to be clear that plenty have ploughed these furrows. As well as Richard Brown and Patricia Gerbarg, there is also Stephen Elliott and a number of teachers who have taught various breathing techniques such as Donna Farhi, Patrick McKeown, Sandra Sabatini and Emil Wendel – but these are only some of the most recent of those exploring the breath.

Way back in the past, the importance of breathing was emphasised in texts from China like *Inward Training (Nei yeh)* which dates to 4th century BCE: “Just let a balanced and aligned breathing fill your chest, and it will swirl and blend within your mind. This confers longevity.” About 100 years later (3rd century BCE), there was *The Annals of Lu Buwei*: “When the breath or energy of the individual is congested and stagnant, the muscles and the bones are contracted and do not flex well.” A few hundred years after that in India, there were the *Yoga Sutras* (about 4th century CE) with *pranayama* (which can be translated as ‘breath control’) as one of the practices.

According to *Roots of Yoga* (edited and translated by James Mallinson and Mark Singleton (Penguin, 2017, p 127)): “Today the physical practice of yoga is popularly identified with bodily postures, but in pre-modern India it was breath-control that was the defining practice of physical yoga.” In those *Yoga Sutras*, a verse states: “*Pranayama* involves the regulation of the exhalation, the inhalation, and the suspension of the breath. The regulation of these three processes is achieved by modulating their length and maintaining this modulation for a period of time, as well as directing the mind into the process. These components of breathing must be both long and uniform.” (2.50; translation by TKV Desikachar).

In 2020, the neuroscientist and writer Dr Sarah McKay stated in her online article *Rethinking The Reptilian Brain*: “Deep breathing definitely returns us to a calmer state. We regulate our breathing rate using our phrenic nerve (a motor nerve that innervates the diaphragm) and the slower breathing somehow signals to activate and ‘calm’ down... [it is] important to note here the parasympathetic nervous system doesn’t slow breathing, we consciously do that via the phrenic nerve.” (<https://drsarahmckay.com/rethinking-the-reptilian-brain/>)

It can be confidently asserted that there has been a significant interest in how we breathe from at least the 4th century BCE to today, more than 2500 years. Discussions, new learnings and debates continue.

Paying Attention

Much modern Western medicine unfortunately pays little attention to breathing and how we breathe. But the way we breathe substantially influences our health, our immune system and our minds. As Richard Brown and Patricia Gerbarg wrote: “By voluntarily changing the rate, depth and pattern of

breathing, we can change the messages being sent from the body's respiratory system to the brain". (p 35)

Breathing is a readily accessible way of becoming more grounded in our bodies, which includes our mental states and our emotions. Elissa Epel, a professor in the department of psychiatry at the University of California, said in 2020: "The rate and depth we breathe at is a huge determinant of our mental state. If we're breathing really shallowly and fast, it causes our nervous system to up-regulate and we feel tense and anxious. If we're breathing slowly, it actually turns on the anti-stress response." (www.youtube.com/watch?v=WN663nOWQ9A)

The rates of average breathing – whatever 'average' might be! – vary widely. A common figure is that the average breath is about four seconds: two seconds in and two seconds out. Stephen Elliott has proposed that the 'average' rate of breathing of people living in the United States is less than three seconds so even quicker. According to US medical authorities, the 'normal range' of breathing is between 12 and 25 breaths per minute. We have evolved to be the worst breathers on the planet. Breathing through the nose has become much less common (when this is what the nose has been designed to do). Just the act of learning how to breathe in and out of our noses can be excellent news for our health.

In James Nestor's words, "I'll explore techniques to expand the lungs, develop the diaphragm, flood the body with oxygen, hack the autonomic nervous system, stimulate immune response and reset chemoreceptors in the brain. The first step is the recovery phase...to breathe through my nose, all day and all night. The nose is crucial because it clears air, heats it, and moistens it for easier absorption." (p 39)

Nestor explained further: "Nasal breathing is far more healthy and efficient than breathing through the mouth...the nose is the silent warrior: the gatekeeper of our bodies, pharmacist to our minds and weather vane to our emotions." (p 44)

Not Easy

I am not going to pretend that this is easy. For some people, this is very difficult. Doing practices with awareness, gentleness and willingness to adapt to individual circumstances is essential to our well-being. If a practice causes agitation, then let go of what you are doing; practice with patience and take your time. For example, making sure that the exhale is neither effortful nor being forcefully controlled; rather, it is a release. It is necessary to regulate the breath rhythm without undue intensity; not the over-effort that many of us know.

Richard Brown and Patricia Gerbarg emphasise that if breathing at the ratio of 6 seconds in/6 seconds out causes discomfort then change the ratio. They have said: "some people with extremely high levels of anxiety may need more time to adjust their breathing." Of course, there are particular exceptions to every proposal. Breathing at this ratio of 6/6 is an average for optimising health and this will slightly vary according to height and lung capacity. For children the ratio is faster.

In some ways, the how of breathing is actually more important than which particular technique is being practiced. For example, constructive advice could be to breathe low and make the breath more three-dimensional (expanding ribs and towards kidney area) instead of focusing on deep breathing. Breadth and width rather than simply vertical depth.

The Respiratory System

According to numerous studies, our ability to breathe full breaths is (in the words of one researcher): “literally a measure of living capacity.” (Nestor, p 55) The diaphragm moves up and down approximately on average about 50,000 times every day. The diaphragm is moving the heart as well as the lungs. In the lungs, there are about 1500 miles of tubes and about 500 million alveoli (the tiny air sacs in the lungs that take in the oxygen into the body which are described as “the workhorses of the respiratory system”).

It is estimated that, on average, people use only about 20% of lung surface area. This is described by Richard Brown and Patricia Gerbarg as “the inner surface that lines the alveoli, the millions of air sacs that exchange oxygen and carbon dioxide with the bloodstream.” (p 128).

Differences of opinion are how we learn. James Nestor suggests: “The key to optimum breathing...is to practice fewer inhaleds and exhaleds in a smaller volume...to breathe less.” (p 86) I believe this instruction “to breathe less” can be confusing. In regards to this statement, Ben Wolff wrote to me: “I go with Stephen Elliott’s research that shows more than 100 million Americans with hypertension through not enough oxygen. I go with Professor Beatrice Golomb and how the starving cells of oxygen accounts for Metabolic Syndrome. I go with the new science that measures about 50% oxygen consumption in the glial cells of the brain, previously something we were unaware of.”

There are many disorders associated with breathing, such as asthma (which now affects about 25 million people in the US; about 8% of the population). A suggested way of relieving the impact of asthma is breathing less (so decreasing the volume of air in the lungs and increasing the amount of carbon dioxide in the body). One strategy for doing this is the Buteyko Method. This is a method for reversing chronic hyperventilation or over-breathing so as to avoid unhealthy levels of carbon dioxide (CO₂) in the body.

However, in *Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach* (Christopher Gilbert, Dinah Morrison and Leon Chaitow (Churchill Livingstone, 2013)) it is stated: “Do improvements in CO₂ sufficiently explain the Buteyko effect? The few studies that have tried to elucidate the mechanisms of the Buteyko Method, while not conclusive, have not tended to support Buteyko’s carbon dioxide theory...it is unlikely that increased levels of CO₂ are the sole reason for the health improvements seen in patients who learn the Buteyko Method.”

There are many reasons why a practice is effective for some people. The relationship between the practitioner and the teacher (this might be described as the placebo effect or the oxytocin inspiration); the other practices that person might be following; the incredibly wide range of causes and conditions that influence health.

Being Better Balanced

It is essential that we are well-balanced within: the relationship of oxygen and carbon dioxide, the blood biochemistry, the body’s balance of acidity and alkalinity, the sympathetic nervous system and the parasympathetic nervous systems. These balances are literally matters of life and death. Homeostasis (“the tendency towards a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes” as defined by the Oxford English Dictionary) is absolutely crucial to health.

A proposal to help us towards this being better balanced is beneficially maximising oxygen levels in the body. But what the Buteyko Method teaches is: “The techniques they used varied, but all circled around the same premise: to extend the length of time between inhalations and exhalations....To just keeping breathing, less.” (Nestor, p 103)

In the words of one Buteyko teacher, the aim is: “When people get stressed...they breathe too quickly, too deeply, too much...The result of breathing more than you should is permanently more oxygen and less carbon dioxide than what your body would thrive on” (Han van de Braak <https://www.aloeride.com/breathing-more-air-delivers-less-oxygen>, 11 March 2016). This argument reflects the belief that breathing more is similar to over-consumption of calories (which can cause obesity).

My preference is for the simplicity of: “The optimum breathing rate is about 5.5 breaths per minute. That’s 5.5 second inhales and 5.5 second exhales. That is the perfect breath.” (Nestor, p 104) Stephen Elliott has said that around 5.85 second inhale and 5.85 second exhale is the most universal coherent breathing. Certainly there are individual exceptions for the ‘resonant rate’ (where heart signal amplitude is highest and blood flow is most efficient). Definitely subtle differences. Or for the ease of something simple and setting a timer: 6 seconds inhale and 6 seconds exhale.

And then with this breath ratio applying these methods...

Slow, Long, Fine, Even, Deep

According to Mimi Deemer: “the five classical methods for breathing that have been used in China for centuries [are]...1) Slow. Breathe using a slow rather than rushed or impatient rhythm... 2) Long. Allow your breath to be long rather than short...3) Fine. A fine breath is the opposite of one that is coarse...4) Even. Invite your breath to become even rather than choppy...5) Deep. Let the breath be deep rather than shallow.” (*Xiu Yang: Self-Cultivation for a Happier, Healthier and Balanced Life*. Orion Spring, 2019, p 72)

These five methods were suggested over 2000 years ago. But now what is true for most of us much of the time is a breath that is hurried, short, rough, uneven and shallow. The reasons for our current patterns of breathing are many: changes in diet, changes in lifestyle, changes in skull structure. According to James Nestor: “Societies that replaced their traditional diet with modern, processed foods suffered up to ten times more cavities, severely crooked teeth, obstructed airways and overall poorer health”. (p 114)

Whether because of social media stimulating distractions or centuries of eating softer food or postural habits such as being crouched over computers or emotions like persistently high levels of anxiety, these patterns of breathing are our reality. One consequence of these ways of breathing can be anxiety and depression; one response to these consequences can be pharmaceutical (more than 10% of the US adult population is taking some form of anti-depressant). Another response is becoming more aware of our breathing and using the breath as one way of changing mind states to some extent.

These modern ways of breathing have many adverse effects on our health, our mind states and our emotions. If we can realise how much the brain listens to the lungs, then we have the possibility to alter these damaging cycles with healthier connections. In James Nestor’s words: “Breathing is a power switch to a vast network called the autonomic nervous system...many of the nerves connecting to the parasympathetic system are located in the lower lung lobes, which is one reason long and slow

breaths are so relaxing...the deeper and more softly we breathe in, and the longer we exhale, the more slowly the heart beats and the calmer we become". (p144).

One technique is using sleep tape at night as a way of increasing oxygen flow to the system and optimising carbon dioxide ratios. Sleep tape keeps the mouth closed during the night and thus maximises nose breathing (which increases the amount of oxygen into the body). It must be emphasised that this technique is not necessarily for everyone! In Ben Wolff's words: "20% more oxygen each breath means 20% more carbon leaves the body. Each breath. It's like going to the gym [as about 80% of fat is released as carbon]. For eight hours every night. Then waking up feeling fantastic. With tape on your face."

Many Techniques

There are hundreds of breathing techniques that aspire to alter our experiences. Emil Wendel, a long-term practitioner and teacher who specialises in *pranayama*, told me that after years and years of practising ever increasingly complicated breathing techniques, he came back to *sama vritti* (this can be translated as same/same or coherent breathing).

For myself, I was once asked why I only practiced coherent breathing rather than other forms of breathing. My response was: "If there were 72 hours in every day then maybe I might do other *pranayama* techniques – but time is limited, life is short, many things needing to be done so I just try to do the best I can..."

Ben Wolff wrote about some of the common breathing techniques. "Extending exhale is not an excellent technique for relaxation and anxiety, from a physiological, neurological, and biochemical point of view. Indeed it's hugely dangerous to artificially distort the chemical balance of the cells, and to deprive the brain of oxygen – nothing drives a brain crazier!"

James Nestor investigated a few of these techniques. Such as the tantric *Tummo* (a combination of breathing and visualising techniques designed to increase a person's inner heat); the Wim Hof method (taking quick deep breaths in through the nose and out through the mouth and then holding the breath after exhale for as long as possible – plus other practices); and Holotropic Breathwork (controlling and quickening breathing patterns). Nestor gives a clear warning that needs to be emphasised again and again: "They are not accessible to everyone ... You can't practice them while flipping through the pages of this book." (p139)

His reports from these frontiers are mixed. It is good to question the reasons for practising these techniques. This questioning illustrates the fact that we all come to these practices for different reasons. To deal with stress and panic attacks. To be calmer. To lose weight. To become an Olympic athlete. To get enlightened. That last reason was probably the primary drive for those practitioners at the time of the *Yoga Sutras* rather than getting tools to manage anxieties or to become more peaceful or to drop a few kilos or to win a race. This can cause some of the uncertainties and doubts around breathing techniques: why are we doing what we are doing?

Breathing Cannot Do Everything

My belief is about keeping it simple. Avoid over-complicating. In James Nestor's words: "The techniques may have been repurposed and repackaged in different cultures at different times for different reasons...they give us the means to stretch our lungs and to straighten our bodies, boost blood flow, balance our minds and our moods...." (p 202)

He continues: “Breathing, like any therapy or medication, can’t do everything...No breathing can heal stage IV cancer...breathing techniques are best suited to serve as preventative medicine, a way to maintain balance in the body so that milder problems don’t blossom into more serious health issues...[It] is a missing pillar of health...a remedy for many of our chronic health problems is right under our noses. It requires no batteries, Wi-Fi, headgear or smartphones. It costs nothing and takes little time and effort. It’s a therapy our ancestors self-administered for thousands of years with only their lips, noses and lungs”. (p 204). Then this clear conclusion: “mouth breathing is terrible...The perfect breath is this: breathe in for about 5.5 seconds, then exhale for 5.5 seconds....” (p 206)

Breath is an excellent and much-needed book. Definitely ideas and practices continue to be debated. Personally I am a fan of neti practice (where warm salt water is used to clean the nostrils). James Nestor does not mention this (nor is Ben Wolff a fan of neti). James Nestor mentions neither the phrenic nerve nor the need for individuality around breathing patterns. But these are very minor quibbles. This is definitely a book that all practitioners can benefit from reading and studying.

My aspiration these days is more around long-term health than short-term highs. I aspire to be as healthy as possible through optimising body systems such as the breath. This is part of my answer to that question about aims: health and healing in this lifetime rather than a rocket to the outer edges of consciousness or placing upon pedestal one person’s extraordinary endeavours and astonishing achievements.

From Myths To Evidence

When we are breathing, numerous mistakes are made. Myths are reinforced and many of the misunderstandings and unnecessary over-complications around breathing are more to do with teachers’ ambitions, delusions and generalisations (as a teacher, I know those places well).

These myths frequently have little to do with what could be appropriate for practitioners’ requirements. A participant in a breath class reported to the teacher that they were feeling light-headed. The teacher’s response to this situation was to say that this was occurring because the practitioner’s soul had left their body to collect information from the source.

Let practices be clear and straightforward as much as possible. A good way of evaluating the evidence when breathing is observe the levels of ease around face, shoulders and hands. If tension is present or arising in these areas, then that could show too much effort in the exercise. Paying attention to breathing enhances our health and improves our abilities to concentrate. Rather than practices that deliberately create confusion and are designed more to delude than to liberate, let practices be grounded in openness, transparency and evidence.

Here are six practical suggestions that hopefully are helpful.

1. Be aware of breathing
2. Remember the 5 characteristics of breathing: slow, long, fine, even, deep
3. Keep the shoulders soft and away from the ears
4. Breathe in and out of your nose as much as possible day and night
5. Have a regular – aspiring towards daily – practice of coherent breathing (six seconds inhale and six seconds exhale)
6. On the right inner wrist, tattoo NBP (Nose Breathing Practice); on the left inner wrist, tattoo WMK (What is Mind Knowing)...this is intended to be light-hearted and humorous!

Norman Blair

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My great gratitude to Richard Brown, Patricia Gerbarg and James Nestor for their important, informative and insightful works.

This article would not have been possible without the ideas, guidance and advice I received from Ben Wolff. My deep gratitude to him for all that he has done. Ben teaches classes, workshops and courses. You can contact him here: ben@breathforlife.co.uk

Appendices

If you would like to purchase sleep tape (for taping the mouth closed during the night – definitely not for everyone!), go here <https://www.medisave.co.uk>, local chemists or other first aid suppliers.

This is from an article published in 2017 in *Breathe: practice-focused education for respiratory professionals* – ‘The physiological effects of slow breathing in the healthy human’ by Marc A. Russo, Danielle M. Santarelli, Dean O’Rourke.

“Perhaps it is time to refine a breathing technique that optimises ventilation, gas exchange and arterial oxygenation, maximises vagal tone, maintains parasympathetic–sympathetic balance and optimises the amount of cardiorespiratory reserve that could be called upon in times of intense physical or mental stress or activity. According to the studies reviewed here, ‘autonomically optimised respiration’ would appear to be in the band of 6–10 breaths per min... Although not reviewed here, nasal breathing is also considered an important component of optimised respiration... there is yet to appear in the literature any documented adverse effects of respiration in the 6–10 breaths per min range. Controlled, slow breathing appears to be an effective means of maximising HRV and preserving autonomic function, both of which have been associated with decreased mortality in pathological states and longevity in the general population.”

<https://breathe.ersjournals.com/content/13/4/298>

This is from an article published in 2018 in *Journal of Neurophysiology* – ‘Breathing above the brain stem: volitional control and attentional modulation in humans’ by Jose L. Herrero, Simon Khuvis, Erin Yeagle, Moran Cerf, and Ashesh D. Mehta

“Using direct intracranial recordings in humans, we correlated cortical and limbic neuronal activity as measured by the intracranial electroencephalogram (iEEG) with the breathing cycle... volitional control and awareness of breathing engage distinct but overlapping brain circuits. During volitionally paced breathing, iEEG-breath coherence increases in a frontotemporal-insular network, and during attention to breathing, we demonstrate increased coherence in the anterior cingulate, premotor, insular, and hippocampal cortices. Our findings suggest that breathing can act as an organizing hierarchical principle for neuronal oscillations throughout the brain and detail mechanisms of how cognitive factors impact otherwise automatic neuronal processes during interoceptive attention.”

<https://journals.physiology.org/doi/full/10.1152/jn.00551.2017>

This is from an article published in 2018 in *Cureus* – ‘The Influence of Breathing on the Central Nervous System’ by Bruno Bordoni, Shahin Purgol, Annalisa Bizzarri, Maddalena Modica and Bruno Morabito.

“The functions of the diaphragm do not stop locally in its anatomy but affect the whole body system. The respiratory rhythm, directly and indirectly, affects the central nervous system (CNS)... The diaphragm is the motor muscle of breath, which can be automatic, forced, or controlled...The main nerves for the peripheral innervation of the diaphragm are the phrenic and vagus (the latter for the crural area)...The phrenic nerve (C3-C5)...sends motor information to the diaphragm and senses information from the vena cava, the pericardium, the pleurae, the Glisson capsule, and the subdiaphragmatic peritoneal area...The diaphragm still has many mysteries to be unveiled, not only on the functions it exerts in the body system but also on the usefulness that a manual approach can have on the patient...we can conclude with this reflection: Breath has patterns. Schemes create behavior. Breath is a behavior. Behavior represents the person. Breath reveals the person.”

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6070065/>