

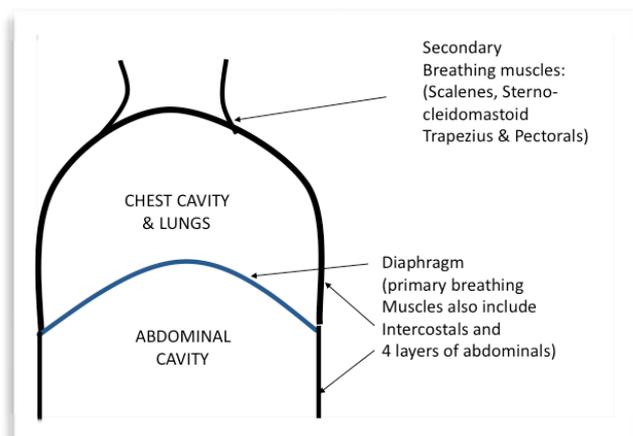
**In our workshops, effective breathing is a powerful take-out for many. It continues to be a challenge for all of us living in hyper-drive. In this insight we will review breathing mechanics and introduce a new theory on why effective breathing and heart rate variability is not just a critical rejuvenation practice - it enables resonant connections with others and therefore leadership.**

## Breath basics

Breathing, so natural and so obvious! Basic to life, masseuse of the vital organs, enabler of expert performance and yet most of us get it wrong. How is that possible for a process that is automatic and unconscious?

Contributions to poor breathing include the pace of life, anxiety (stress), prolonged sitting (particularly if slumped) asthma, and lung disease. The basic function of breathing is to extract oxygen (O<sub>2</sub>) from the air for metabolism and to remove the carbon dioxide (CO<sub>2</sub>) produced by metabolism.

Fortunately, we do not have to think about our breathing. It is driven from the brainstem and

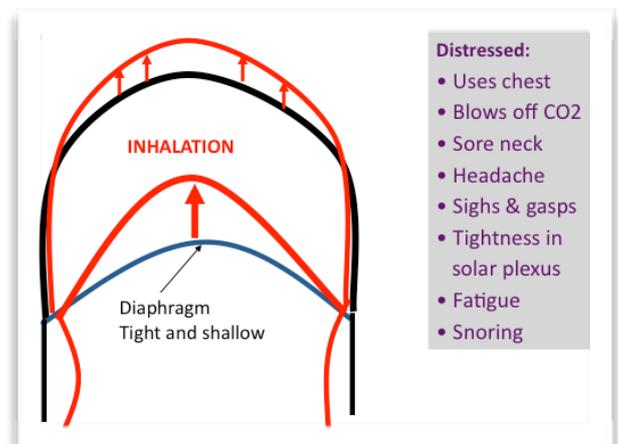


continues if unconscious. We can take voluntary control of it. We breathe air into our chests, extracting O<sub>2</sub> for life and depositing CO<sub>2</sub> as waste. Ideally, the diaphragm ventilates the lungs.

Inhalation causes an outward swelling of the lower ribs and belly. Normal adult breathing is ideally about 12 breaths per minute. It is increasing!

## Distressed Breathing

Many of us develop accelerated and shallow breathing in our hyperdrive lives. This is commonly called hyperventilation and is a factor in fatigue, distress, dizziness, poor sleeping, irritability and poor health.



In distress, we activate secondary muscles in the neck and upper chest. This causes rapid, shallow breathing.

This is OK if we are yelling at a tiger but becomes a problem if maintained. This upper chest breathing – or hyperventilation – causes us to blow off too much CO<sub>2</sub>. Blood pH increases blocking the release of O<sub>2</sub> to brain and body. Breathing rate will be about 16 per minute. Blood flow to the prefrontal cortex can drop by 50%.

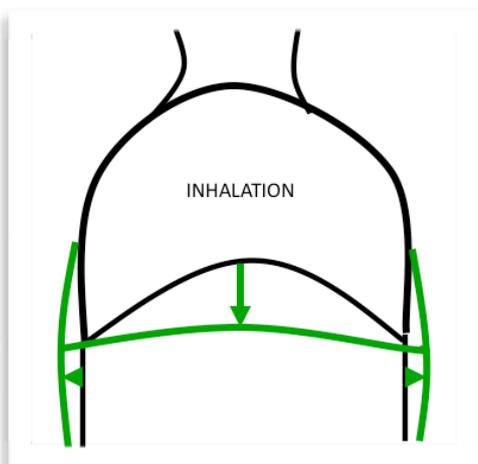
One might also notice breath holding on inhale, “pah” on exhale and long sighs. Dizziness, shortness of breath, tingling around mouth and fingers, fatigue and agitation are just some of the symptoms. Some end up in hospital.

Mild cases can cause perceived “stress”, fatigue and poor concentration. The clues are:

- Breathing with the upper chest
- Holding the belly stiff and tight
- Visible use of neck muscles
- Breath holding and “pahh” on exhalation
- Neck pain, shoulder stiffness & headaches
- Sharp inhalation and deep sighs on exhale
- Nagging desire to suck air in

Breathing can be corrected with enormous benefits to our daily lives and performance.

Optimal breathing is diaphragmatic, slow and even. On inhalation the diaphragm contracts and presses down on the abdominal contents filling the lower parts of the lung. As the diaphragm relaxes it domes upward pressing air out.



Diaphragmatic breathing is efficient, effective and a quick way to relax and calm the mind. Optimal diaphragmatic breathing can be 3 to 6 breaths per minute. This is one of the goals of yoga pranayama practice.

## Improving your Breathing

Working at effective diaphragmatic breathing can benefit all of us. In the case of hyperventilation, simple improvements can improve your health, sense of wellbeing and performance. Below is a practical guide:

1. Start lying flat on a firm surface
2. Place a hand on your belly and on your chest
3. Simply watch the rise and fall of your hands
4. Gently nudge your inhale to 3 seconds
5. Slow and extend your exhale to 5 seconds
6. Relax and soften your chest and shoulders
7. Allow your belly and lower ribs to rise & fall
8. Relax, soften your facial muscles
9. Pause gently at the end of exhalation
10. Continue for 5 to 10 minutes

As you become competent, practice the same routine while sitting. It is very important to sit upright with your spine light and long. Each time you feel a tug of stress or frustration simply exhale fully and do 5 slow even breaths wherever you are.

## Current & Emerging Theory

There are limited randomised clinical trials (RCT) so research-based medicine is cautious. However, two major reviews of the benefits of diaphragmatic breathing are clear. Increasingly, research in neurology, cardiology and physiology are creating more integrated views. I would like to review two such perspectives that, in my opinion, hold some extraordinary hope. The future of this research will be exciting and is likely to have profound practical applications.

## The Polyvagal Theory

Stephen Porges describes this as “Neurological foundations of emotions, attachment, communication and self regulation”. The book is a monster but here are the basics.

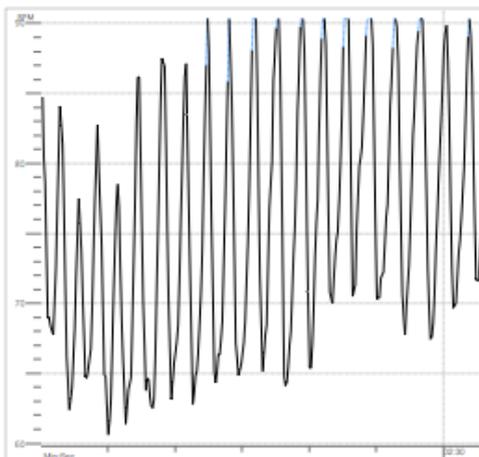
The Autonomic, and largely unconscious, Nervous

System (ANS) is made up of the Sympathetic (SNS) and Parasympathetic components (PNS). Both exist in early reptilian evolution and continue to evolve.

The Parasympathetic System works through the Vagus nerve – the 10<sup>th</sup> Cranial nerve. The older part activates a slowing of the body and stimulates digestion and organ function – it acts primarily below the diaphragm. Thus it facilitates rejuvenation and repair. When strongly activated we get the primitive immobilisation response. The gut voids, blood pressure collapses and we can feign death.

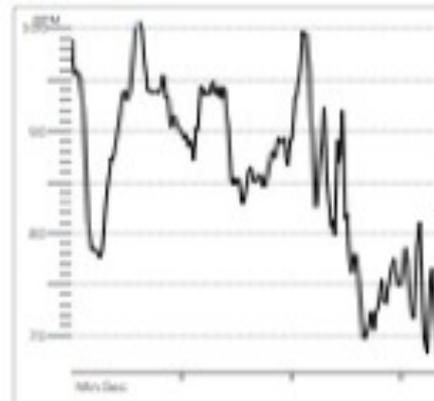
This powerful activation can save a snake from predation but is a major risk for humans in a modern, social environment. This is the freeze reaction on stage, withdrawal, procrastination, bursting into tears, and some of the inertia that goes with depression.

The newer part of the Vagus nerve acts above the diaphragm. It regulates the heart and lungs for efficient blood oxygenation. We call this Respiratory Sinus Arrhythmia (RSA) or Heart Rate Variability (HRV). As we inhale the heart accelerates slightly and as we exhale the heart slows slightly. The amplitude of this sine curve is a powerful indicator of health, resilience and social effectiveness.



High amplitude RSA between 60 and 90 bpm

The Sympathetic Nervous System runs through the spinal cord and activating heart, muscles the adrenal gland. Adrenaline accelerates the heart and increases blood pressure. It also switches off both components of the Vagus preparing us for flight and fight reactions. Short term this may be appropriate. Long term it is a disaster



### Sympathetic response causing a chaotic variation and low amplitude RSA.

The new part of the Vagus is a more recent evolution in mammals and is myelinated (insulated for greater speed and specificity) The New Vagus has two functions:

1. Increasing heart rate variability or RSA, and
2. Graded control of the Vagal brake

The first optimises health and resilience and the second allows focused attention, skilled movement and social engagement. Porges has shown that poor function of the new Vagus is associated with infant respiratory distress, adult distress, post traumatic stress (PTSD), Autism and Borderline Personality Disorder (BPD).

The Vagal Brake is a term he uses to describe the skilful activation of this new Vagus when we are faced with a challenge. We always understood challenge to activate the Sympathetic System leading to flight and fight. However, the Vagal brake allows us to stay calm, engaged and effective in the face of a challenge.

This is a fascinating deep insight into the difference

between someone who engages challenge with calm effectiveness and someone who becomes distressed and dysfunctional. A critical feature is “feeling safe” or “immobilisation without fear”. Oxytocin is a vital ingredient into this mix which permits self awareness, attention, empathy, engagement and physical contact.

In short, he proposes that it is an effective Vagal brake that gives us access to our emotional state, self regulation, communication skills and social engagement skills – in short Emotional Intelligence.

His current work is exploring how we can stimulate this new part of the Vagus as a potential remedy for the increasing burden of distress, PTSD, Aspergers – Autism spectrum disorders, and other social compromise (BPD being one).

It appears that slow diaphragmatic breath and Heart Rate Variability training may help us to activate and train this new part of the Vagus. Complementary research in heart rate variability and mindfulness practices support this effect and the benefits suggested.

Perhaps this is a good moment for a long slow exhalation.....

## Emotional Styles of the Brain

Richard Davidson, perhaps the leading neurobiologist in brain imaging has just published his work on how mindfulness affects the brain. At the core of mindfulness is slow and relaxed breathing with an upright spine.

He has shown clearly how these practices show structural and functional improvement in:

1. Self awareness (insula)
2. Bounce back (prefrontal cortex)
3. Positivity (prefrontal cortex)
4. Social intuition (fusiform & amygdala)
5. Sensitivity to context (hippocampus)

6. Attention & focus (prefrontal & Nucleus Accumbens)

Davidson’s book is very readable and I encourage you to read it. It reinforces a powerful new message: training your mind creates structural and functional changes that improve your health, wellbeing and task performance. Most of the research is relatively short term – 6 weeks to 6 months. This is very encouraging.

Davidson also talks about long-term meditators who achieve quite extraordinary brain changes. In particular, their brains show massive up-regulation of the left prefrontal cortex. This area is a convergence zone for bounce back, positivity, attention, emotion regulation and flow.

Curiously the wisdom traditions (Buddhism, Yoga and others) defined, 2,500 years ago, a clear philosophy and practice for achieving the obvious next step for humanity. If we had more left prefrontal cortex activation we might see less violence, less addiction, less depression, improved social engagement and more happiness.

The Polyvagal Theory pushes toward similar conclusions. If we could activate the new and myelinated Vagus we would be calmer, happier, more focused and effective, and engage with others better. Porges concludes with the critical role of the Vagal brake in forming the connection, engagement and dance that becomes love and the bond of marriage.

## Hope Ignited – Action invited

Both approaches show clearly that we are capable of training and improving our ability to focus attention, co-ordinate action and engage socially. The PolyVagal Theory describes the deep underlying mechanisms of engagement with challenge – the calming effect of the old Vagus, the activation of the Sympathetic system, and the role of the New Vagus in regulating an optimal

state and providing a skilful brake in the excitement and complexity of social engagements.

In essence this is a bottom up model: biological state (body), facilitates emotion, guides cognition and enables action.

Davidson's work is more easily accessible as cognitive beings. It is a top down model: mindfulness practice (action) is primarily attention training shows increasing evidence of bottom up effects – health, happiness and effectiveness.

There is a trap. The practice of meditation requires that we feel really safe but in fact sitting quietly with eyes closed and thinking of nothing might trigger floods of anxious thoughts. This is an absolutely normal animal defence system gearing up to seek out threats. It is no wonder some people find meditation very difficult and why it might be nearly impossible for someone with chronic anxiety or PTSD.

Perhaps a first step is to learn how to relax, recover from challenges, breathe correctly and savour some time feeling safe. Then, perhaps we can advance to meditation.

Having worked in Resilience for many years and supported the range of practical skills that facilitate bounce back and growth, these two new advances provide powerful academic support for our Performance Supply Chain (Body, Heart, Mind and Action) and many of our practices. Exciting time indeed!

And, at the core is a relaxed, calm practice of diaphragmatic breath.

### What you can do

- Watch your breathing
- Look out for signs of hyperventilation
- Slow and extend your exhalation
- Breathe slowly into a relaxed diaphragm

- Focus your attention on your breath
- Recognise and counter fear
- Connect with those who trigger safety
- Learn basic mindfulness
- Practice yoga & consider Pranayama
- Make time to relax

### References

Burgess, J et al. (2011) *Systematic review of the effectiveness of breathing retraining in Asthma management*. *Expert Rev Resp Med*. 5 (6): 789-807

Porges, S. (2011) *The Polyvagal Theory*

Davidson, R. (2012) *The Emotional Life of Your Brain*