CLASS 6

OXYGEN ADVANTAGE®

BY PATRICK MCKEOWN

HEART RATE VARIABILITY

HEART RATE VARIABILITY

- Substantial support for heart rate variability biofeedback (HRVB) for a variety of disorders and for performance enhancement (Gevirtz, 2013).

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- The time between beats is the R–R interval.
- Fluctuation of R–R intervals is a physiological occurrence known as heart rate variability (HRV).

- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

HEART RATE VARIABILITY

- HRV and blood pressure fluctuations occur both randomly and rhythmically.

- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

HEART RATE VARIABILITY

- Respiratory sinus arrhythmia (RSA) is HRV in synchrony with the phases of respiration, whereby heart rate increases during inspiration and decreases during expiration.

- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

HEART RATE VARIABILITY

- Respiratory sinus arrhythmia controls the rate of gas exchange at the alveoli, such that heart rate tends to be higher when air in the lung is richest in oxygen, and exhalation occurs when carbon dioxide in the lung is highest.

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- Respiratory sinus arrhythmia also can reflect aspects of autonomic function. It is controlled entirely by the vagus nerve, such that vagus nerve outputs to the sinoatrial node primarily occur only during exhalation.

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- RSA is sometimes used as index of parasympathetic tone (Porges, 1986).
- Lehrer et al. Resonant Frequency Biofeedback Training to Increase Cardiac Variability: Rationale and Manual for Training Applied Psychophysiology and Biofeedback, Vol. 25, No. 3, 2000

HEART RATE VARIABILITY

- Greater vagus nerve traffic will therefore produce greater amplitudes of RSA, such that many scientists equate RSA (or HF HRV) with “cardiac vagal tone,” or parasympathetic influence on the heart.
- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- It is known that the vagal system interacts closely with the inflammatory system, such that increases in vagus nerve traffic (usually produced by electrical vagal stimulation) are associated with decreases in serum levels of various inflammatory cytokines

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- There is a large amount of evidence that people are more resilient – physically and emotionally – when HRV oscillation amplitudes are higher and more complex.

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- Individuals with low HRV have generally impaired function: they are physically or emotionally sick, are older, are less aerobically fit and, when greatly physically compromised, at greater risk of dying.

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- Baroreceptors in the walls of main blood vessels detect stretching of the arteries as blood pressure increases. When blood pressure increases, the baroreflex causes immediate decreases in heart rate. As blood pressure falls, the baroreflex causes immediate increases in heart rate.

- Lehrer et al. Heart rate variability feedback. How and why does it work? Frontiers in psychology. July 2014.

HEART RATE VARIABILITY

- Both HRV (RSA) and baroreflex sensitivity are maximised when respiration is slowed to ~6 breaths per min
- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

HEART RATE VARIABILITY

- The sensitivity of the arterial baroreflex is inversely proportional to the sensitivity of the peripheral chemoreflex.

- Trembach Nikita, Zabolotskikh Igor. Breath-holding test in evaluation of peripheral chemoreflex sensitivity in healthy subjects. Respiratory Physiology & Neurobiology 235 (2017) 79–82

HEART RATE VARIABILITY

- Increasing tidal volume and diaphragmatic breathing has been shown to significantly increase RSA.

- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

HEART RATE VARIABILITY

- 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.
- Russo et al. The physiological effects of slow breathing in the healthy human. Breathe. December 2017. Volume 13. No 4. http://doi.org/10.1183/20734735.009817

Weight Lifting

WEIGHT LIFTING

- In general, I would hold my breath (breathe in, breathe out, hold) execute a set, minimise breathing for 6 breaths before normal breathing. Some sets I had to either break my breath hold or I forgot to minimise breathing. But in general, this was what I did

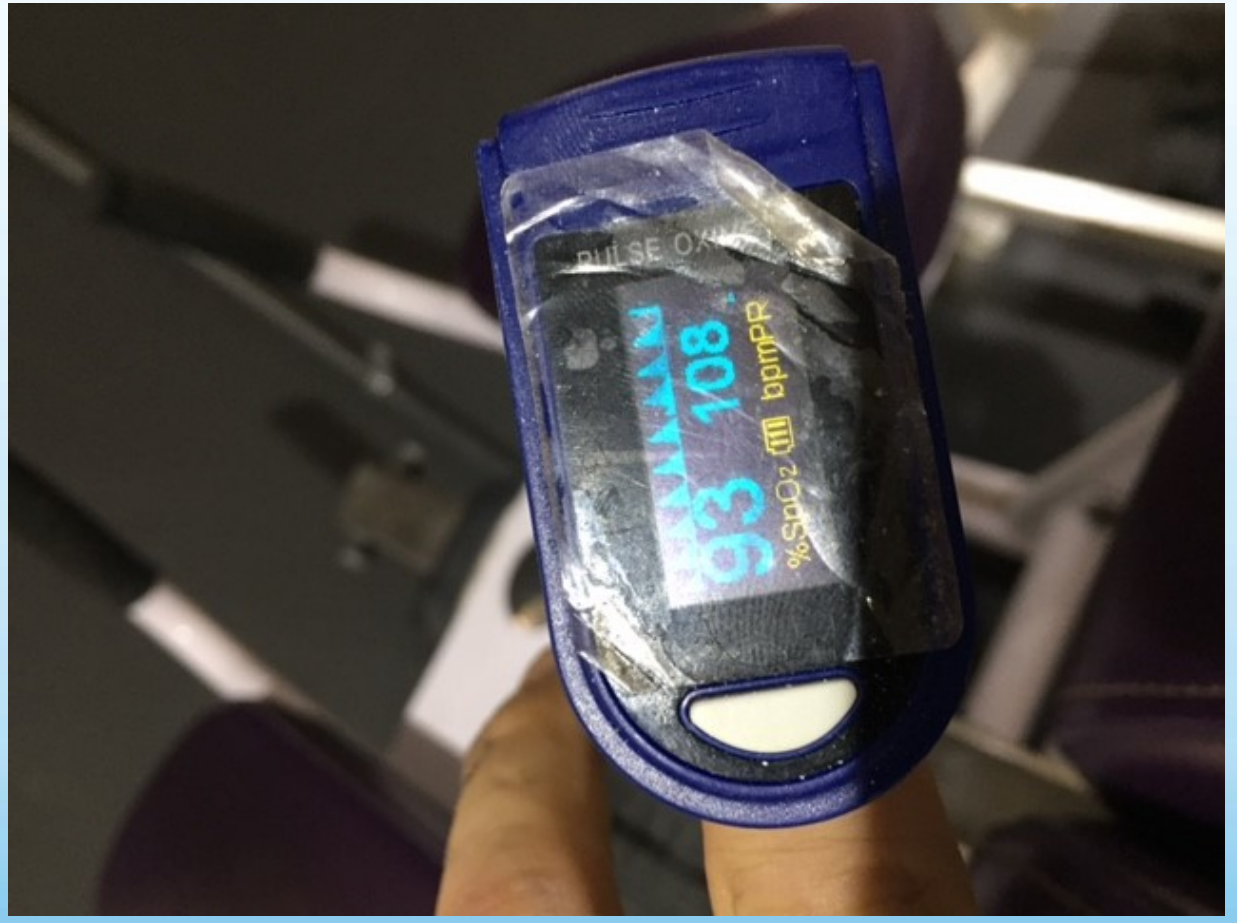
  - the breath holds added in another "load", as you said, especially psychologically, even though the urge to breath Is physiological. A challenge I relished.

WEIGHT LIFTING

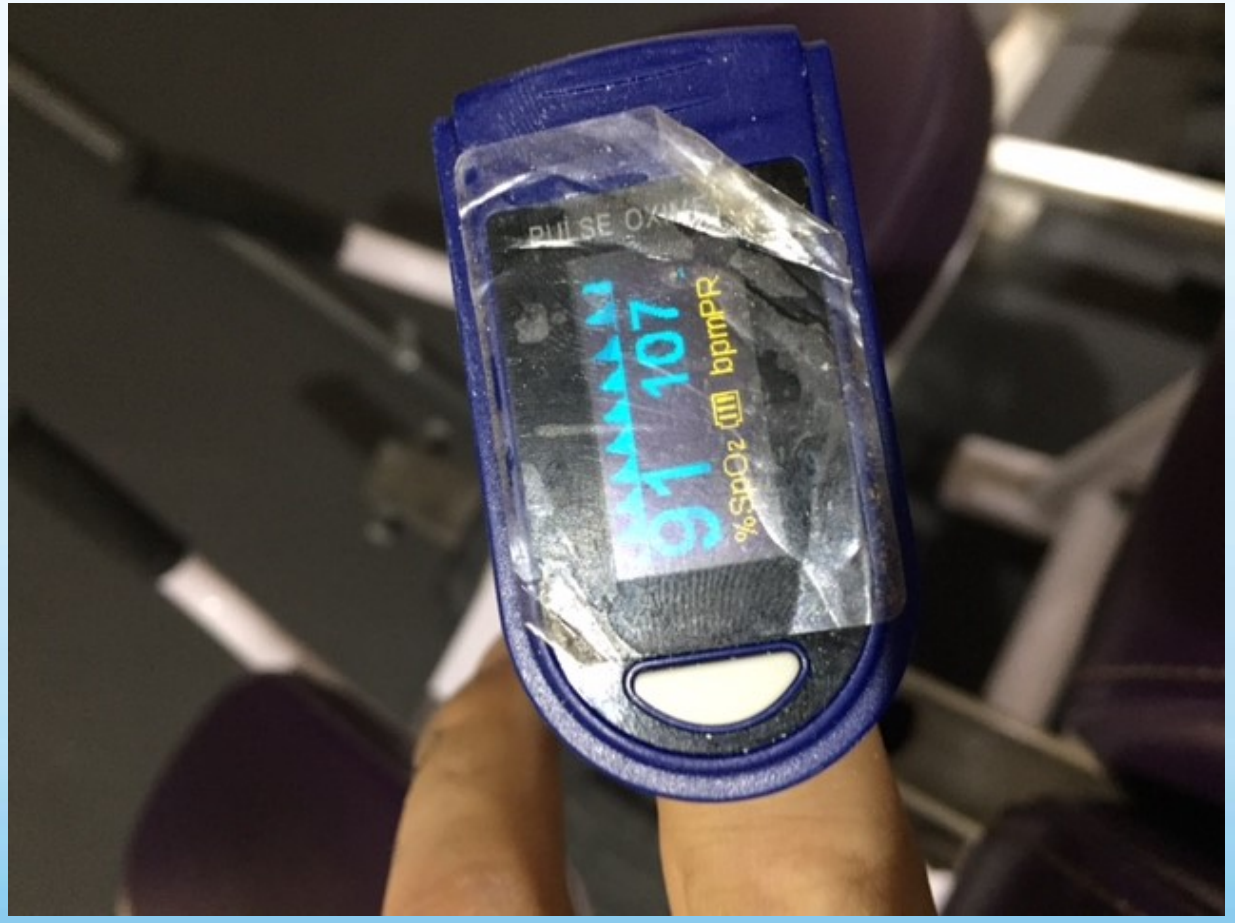
- On smaller body parts, like arms, it is easier to control and push through the "load", although when it comes to bigger body parts like back and legs, it gets very difficult. It is with these bigger muscle groups where I feel the 85% wall, and need to breathe in order to progress through the set

- The readings are from an upper back workout. I would do a set, put on my oximeter, take a snap shot, and then strap on my blood pressure cuff

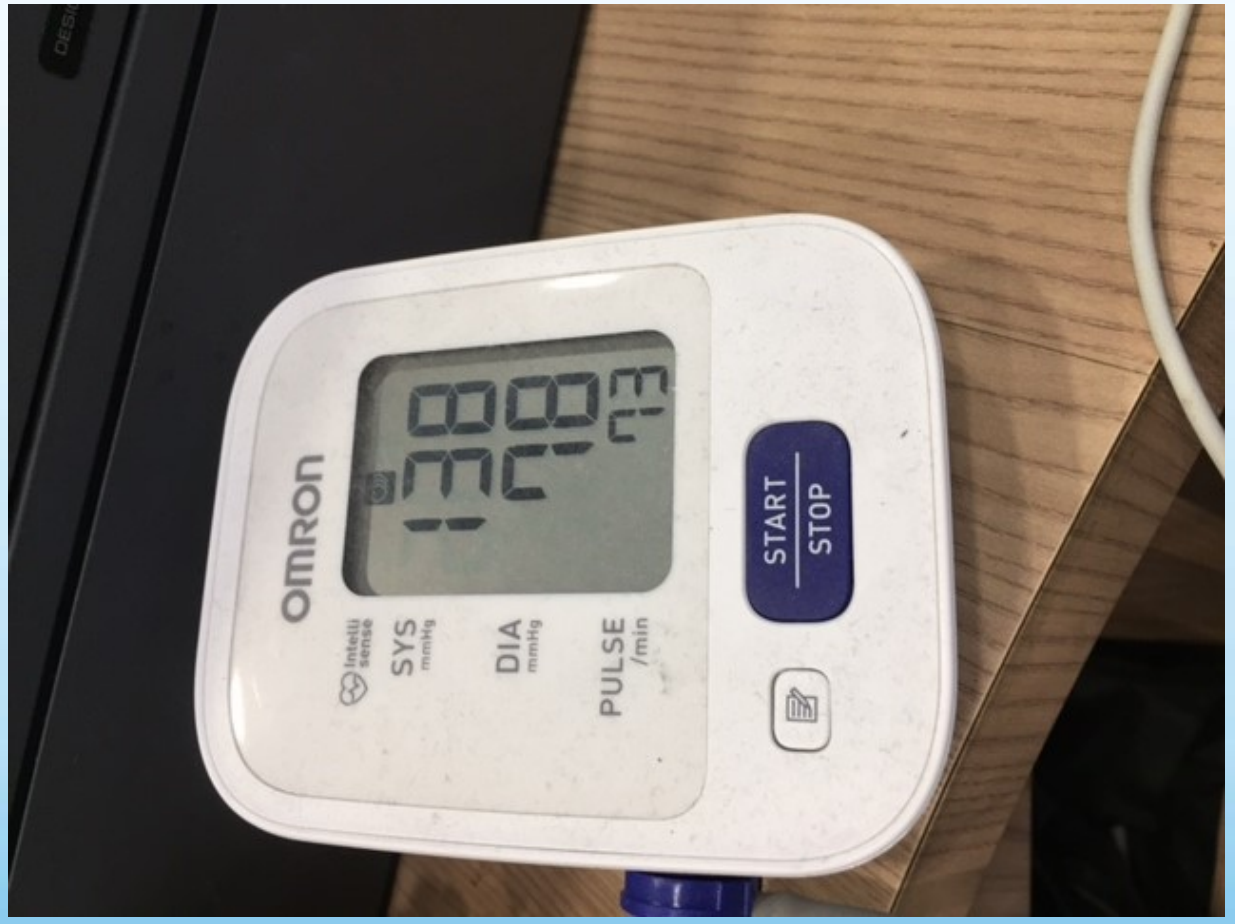
FIRST SET WITH BREATH HOLDS



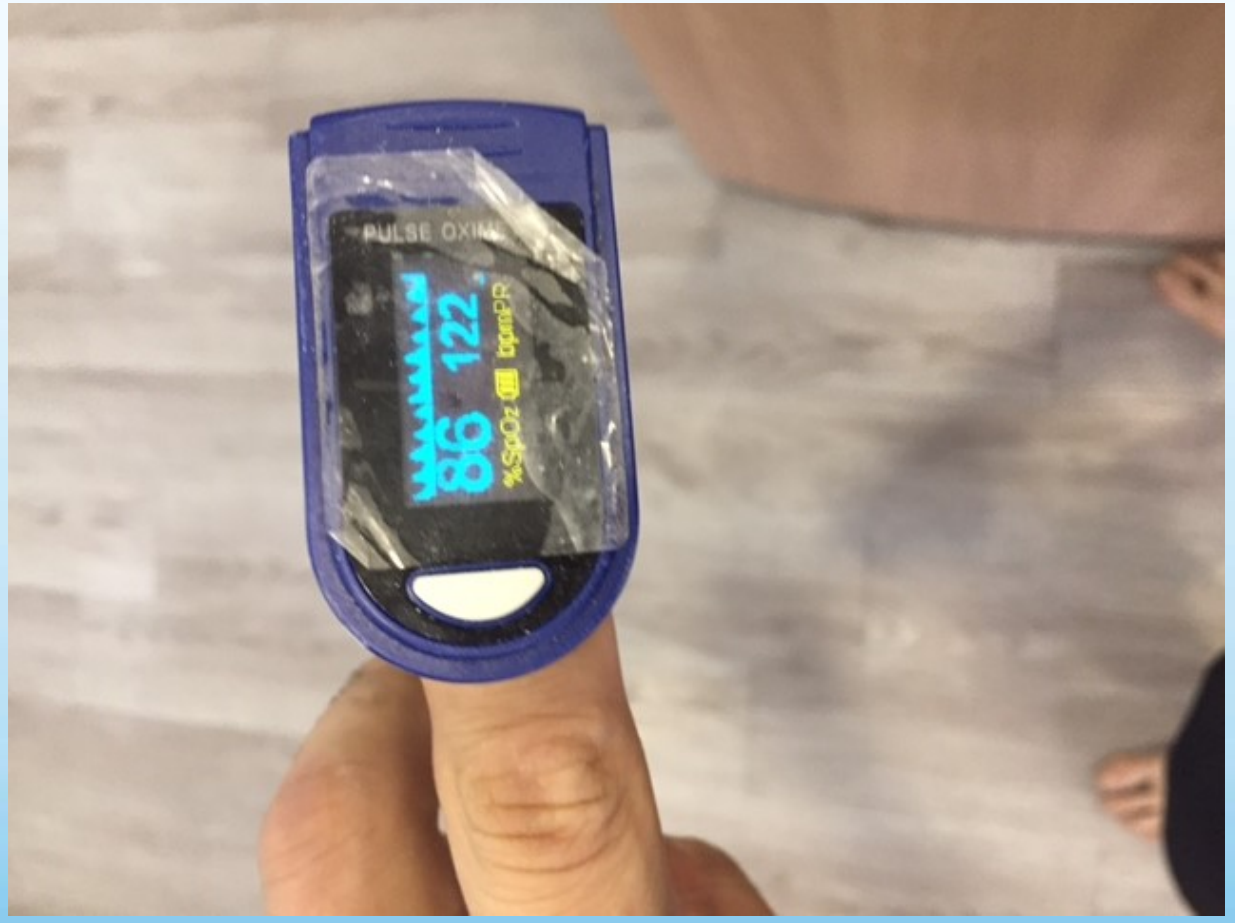
FIRST SET WITH BREATH HOLDS



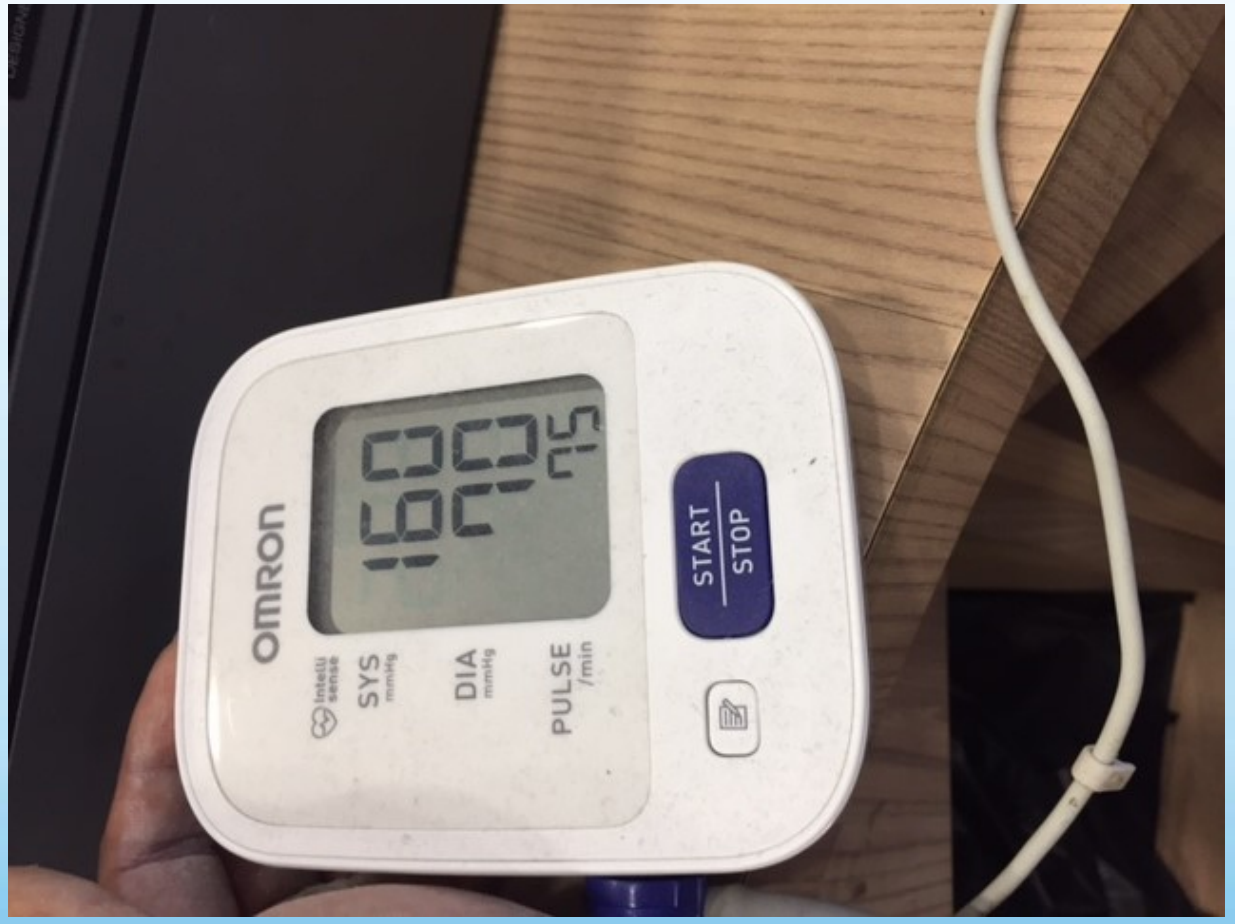
FIRST SET WITH BREATH HOLDS



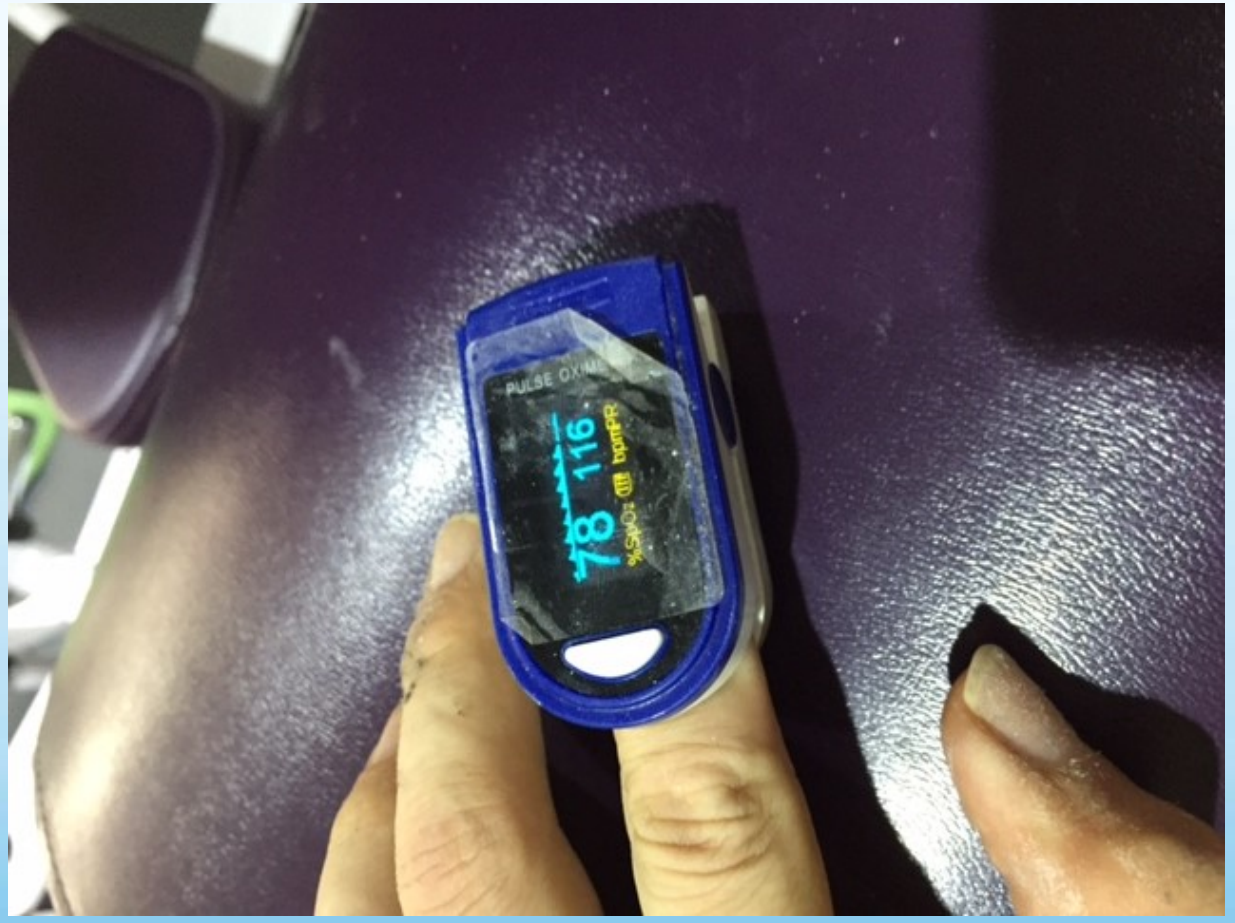
SECOND SET WITH BREATH HOLDS



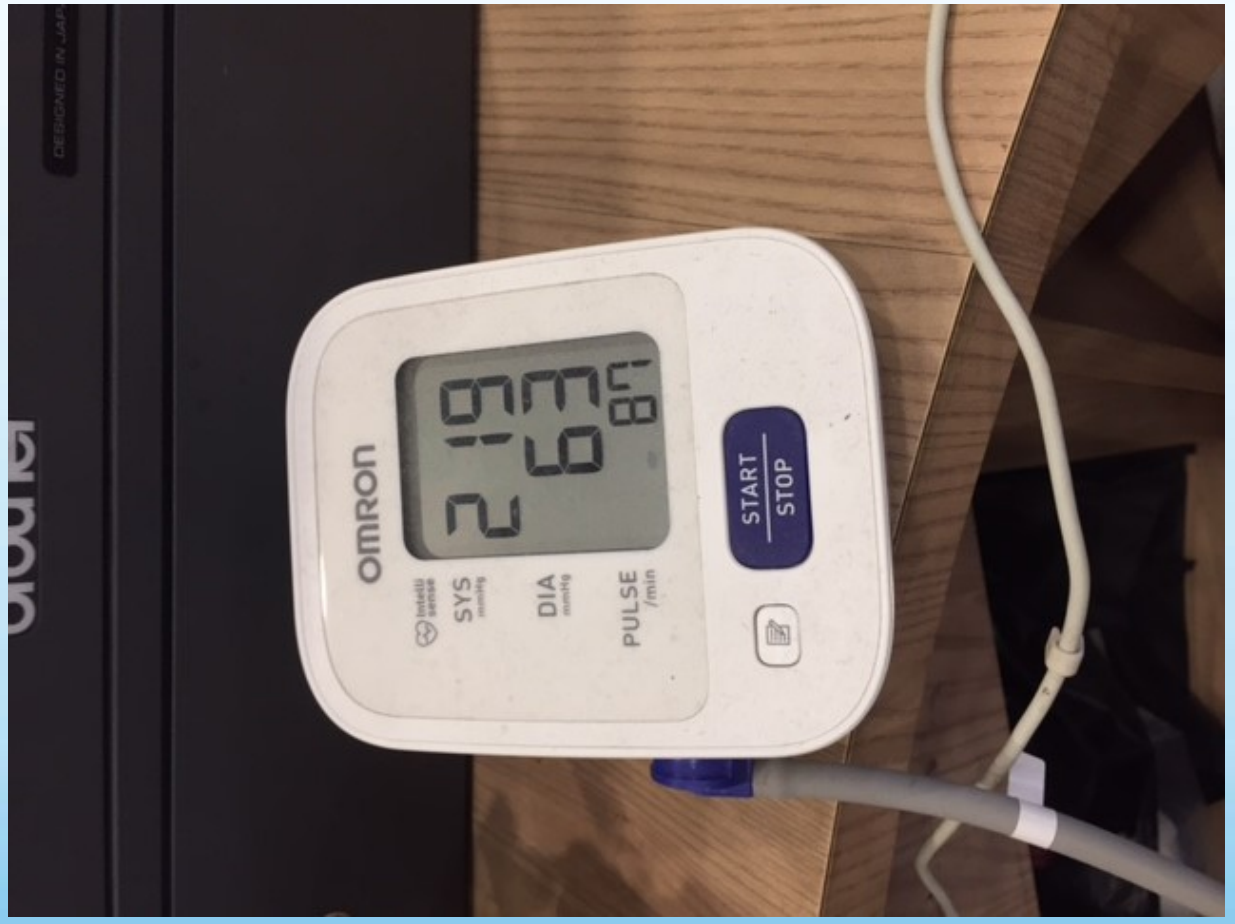
SECOND SET WITH BREATH HOLDS



THIRD SET WITH BREATH HOLDS (upped weight)



THIRD SET WITH BREATH HOLDS (upped weight)



Intra abdominal pressure. Core strength.

INTRA ABDOMINAL PRESSURE

- The diaphragm is required to perform the dual role of respiration plus postural control/stabilization during movement (Hodges & Gandevia 2000).

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- The muscles essential to static and dynamic stability are the diaphragm, transversus abdominis, multifidis and the pelvic floor muscles.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- Of all the abdominal muscles, transversus plays the most significant role in synchronizing pressure changes with the diaphragm for optimal respiration as well as stability and postural support (De Troyer et al 1990).

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- When these muscles work together in harmony, ideal intra-abdominal pressure occurs which predominantly protects the lumbar spine (Hodges & Gandevia 2000).

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- The diaphragm is at its most relaxed at the end of the exhalation phase.
- If the diaphragm returns to a relatively constant resting position at the end of each contraction-relaxation cycle, this will maintain respiratory load and breathing frequency.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- Another important factor to consider is the zone of apposition. This is the area of the diaphragm encompassing the cylindrical portion, which corresponds to the inner aspect of the lower rib cage.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- The transversus abdominis muscle, alongside the diaphragm, plays a large role in the prediction of this zone and pressure regulation (Urmey et al 1998).

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- The zone of apposition relates to the resetting end-position of the diaphragm and the corresponding efficiency of movement.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- For example an incomplete exhalation, as seen in hyperinflation, leaves the diaphragm in a lower, flatter position; this is a smaller zone of apposition versus that of a complete exhalation, which allows a fuller doming, and a correspondingly larger zone.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- If the respiratory accessory muscles, or the abdominal muscle group, shorten or are weakened, the diaphragm is unable to return to its optimal resting position, and as a result pressure generation is decreased.

- Chaitow L. et al. Recognizing and Treating Breathing Disorders: A Multidisciplinary Approach. Chapter 7. Breathing pattern disorders and the athlete Tania Clifton-Smith. Dec 9, 2013.

INTRA ABDOMINAL PRESSURE

- A healthy breathing pattern is principally one of lateral expansion of the lower rib cage. This only occurs if there is sufficient generation of IAP acting through the zone of apposition between the diaphragm and lower pole of the thorax ‘to push the ribs out’ (Urmey et al., 1988; De Troyer, 1997).

- Josephine Key. The core’: Understanding it, and retraining its dysfunction. Journal of Bodywork & Movement Therapies (2013) xx, 1e19

INTRA ABDOMINAL PRESSURE

- This ‘respiratory generated IAP’ simultaneously contributes towards the postural support and stabilisation system.

- Josephine Key. The core’: Understanding it, and retraining its dysfunction. Journal of Bodywork & Movement Therapies (2013) xx, 1e19

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RESPIRATORY MUSCLE FATIGUE

RESPIRATORY MUSCLE TRAINING

- During heavy exercise, breathing frequency rises to 40 to 50 breaths per minute. Tidal volume is 3 to 4 litres. This gives a minute volume of 120 to 160 litres.
- For Olympic class male endurance athletes, tidal volume can be as high as 5 litres resulting in a minute ventilation of 200 to 250 litres.

- *McConnell. A. Breathe Strong. Perform Better.*

RESPIRATORY MUSCLE TRAINING

- During intense exercise, the demands on proper functioning of the respiratory system are markedly increased. Research has shown that the respiratory system often “lags behind,” while cardiovascular function and skeletal muscle improve with aerobic training (Bye et al., 1983; Wagner, 2005).

- *Scand J Med Sci Sports 2015: 25: 16–24*

RESPIRATORY MUSCLE TRAINING

- There are several lines of evidence suggesting that the diaphragm should be the most important muscle to target during IMT.
- Studies suggest that more than 50% of healthy humans with varying fitness levels develop diaphragmatic fatigue after bouts of high-intensity constant work rate

- *Diaphragm Recruitment Increases during a Bout of Targeted Inspiratory Muscle Training.* Medicine & Science in Sports & Exercise · *2016 Jun;48(6):1179-86*

RESPIRATORY MUSCLE TRAINING

- The lungs do not respond to physical training. Training does not increase lung volumes, improve lung function or enhance the ability of the lungs to transfer oxygen to the blood. (Wagner 2005)

- *McConnell. A. Breathe Strong. Perform Better.*

RESPIRATORY MUSCLE TRAINING

- There is strong evidence that the diaphragm and other respiratory muscles may become exhausted during both short term, high intensity exercise (Bye et al) and more prolonged exercise such as marathon running (Loke et al)

- *Tim Noakes .The Lore of Running.*

RESPIRATORY MUSCLE TRAINING

- The ventilatory response during heavy exercise requires substantial increases in both inspiratory and expiratory muscle work, often leading to respiratory muscle fatigue.

- *Markus Amann, Pulmonary System Limitations to Endurance Exercise Performance in Humans. Exp Physiol. 2012 March ; 97(3): 311–318*

RESPIRATORY MUSCLE TRAINING

- As the respiratory muscles fatigue they require an increasing amount of blood flow and oxygen in order to continue. As fatigue sets in, the respiratory muscles are thought to potentially monopolize the blood flow needed for the locomotor muscles.

- *The Effects of Inspiratory Muscle Training on Anaerobic Power in Trained Cyclists By Courtenay McFadden Accepted in Partial Completion of the Requirements for the Degree Master of Science*

RESPIRATORY MUSCLE TRAINING

- To stimulate any muscle to undergo adaptation, the muscle must be overloaded. This means forcing it to do something that it is not accustomed to. Most aerobic training is within the comfort of working muscles. High intensity training would be best- but cannot be sustained long enough to provide an effective overload.

- *McConnell A. Breathe Strong, Perform Better.*

BREATH HOLD TRAINING

BREATH HOLD TRAINING

- The "extradiaphragmatic" shift in inspiratory muscle recruitment may reflect an extreme loading response to breathing against a heavy elastance (i.e., closed glottis).
- *Med Sci Sports Exerc. 2013 Jan;45(1):93-101*

BREATH HOLD TRAINING

- In addition, the relative intensity of diaphragmatic and inspiratory rib cage muscle contractions approaches potentially "fatiguing" levels by the break point of maximal breath holding.
- *Med Sci Sports Exerc. 2013 Jan;45(1):93-101*

BREATH HOLD TRAINING

- Limiting breath frequency during swimming further stresses the respiratory system through hypercapnia and mechanical loading and may lead to appreciable improvements in respiratory muscle strength.

- *Scand J Med Sci Sports 2015: 25: 16–24*

BREATH HOLD TRAINING

- 20 competitive college swimmers were randomly divided into either the CFB group that breathed every 7 to 10 strokes, or a control group that breathed every 3-4 strokes.
- *Burtch AR[1], Ogle BT, Sims PA, Harms CA, Symons TB, Folz RJ, Zavorsky GS. Controlled Frequency Breathing reduces Inspiratory Muscle Fatigue. J Strength Cond Res. 2016 Aug 16.*

BREATH HOLD TRAINING

- After four weeks of training, only the CFB group prevented a decline in MIP values. CFB training appears to prevent inspiratory muscle fatigue.

- *Burtch AR[1], Ogle BT, Sims PA, Harms CA, Symons TB, Folz RJ, Zavorsky GS. Controlled Frequency Breathing reduces Inspiratory Muscle Fatigue. J Strength Cond Res. 2016 Aug 16.*

BREATH HOLD TRAINING

- Swimmers, who were subjected to the hypercapnic-hypoxic regimen, had significantly improved strength of their inspiratory muscles in comparison to swimmers in the control group.

- *Dajana KARAULA 1, Jan HOMOLAK 2, Goran LEKO. Effects of hypercapnic-hypoxic training on respiratory muscle strength and front crawl stroke performance among elite swimmers. Turkish Journal of Sport and Exercise. Year: 2016 - Volume: 18 - Issue: 1 - Pages: 17-24*

BREATH HOLD TRAINING

- Experimental group have improved the inspiratory muscle strength values (MIP) for 14.9% and the expiratory muscle strength values (MEP) for 1.9% in relation to the control group.

- *Dajana KARAULA 1, Jan HOMOLAK 2, Goran LEKO. Effects of hypercapnic-hypoxic training on respiratory muscle strength and front crawl stroke performance among elite swimmers. Turkish Journal of Sport and Exercise. Year: 2016 - Volume: 18 - Issue: 1 - Pages: 17-24*

BREATH HOLD TRAINING

- Voluntary holding of breath may have resulted in involuntary contractions of intercostal muscles during the hypercapnic-hypoxic practice. It is also assumed that above mentioned contraction occurrence has resulted in hypertrophy of intercostal muscles.

- *Dajana KARAULA 1, Jan HOMOLAK 2, Goran LEKO. Effects of hypercapnic-hypoxic training on respiratory muscle strength and front crawl stroke performance among elite swimmers. Turkish Journal of Sport and Exercise. Year: 2016 - Volume: 18 - Issue: 1 - Pages: 17-24*

TEACHING HALF DAY FORMAT

TEACHING

- Pdfs available from OxygenAdvantage website. Use the text from pdf as a basis of your offering.
- Images available from instructors training portal- go to Marketing
- Advertise events at least six weeks in advance
- Prices vary depending on location
- Presentations are available: Essential Learning-presentations- Athlete day, The Oxygen Advantage manual for athletes.

HALF DAY FORMAT

- Enter the zone
- Measure BOLT score
- Measure MBT
- Functional breathing
- Simulate high altitude training
- Sleep, incorporating into way of life

ONE DAY FORMAT

- Functional Breathing for Functional Movement
- Simulation of high altitude training
- Delay the onset of lactic acid and fatigue
- Improve aerobic capacity
- Significantly reduce exercise induced asthma
- Oxygen Advantage® Practical workout
- Using SportsMask to improve performance
- Sleep, concentration and focus
- Applying the Oxygen Advantage® daily