Clinical studies including thousands of participants spanning a 30-year period offer persuasive evidence that the most significant factor in health and longevity is how well you breathe.

1. The Framingham study focused on the long-term predictive power of vital capacity and forced exhalation volume as the primary markers for life span.

"This pulmonary function measurement appears to be an indicator of general health and vigor and literally a measure of living capacity". Wm B. Kannel and Helen Hubert.

These researchers were able to foretell how long a person was going to live by measuring forced exhalation breathing (flow rate) aka FEV1 and hypertension. We know that much of hypertension is controlled by the way we breathe.

"Long before a person becomes terminally ill, vital capacity can predict life span." William B. Kannel of Boston School of Medicine (1981) stated, "The Framingham examinations' predictive powers were as accurate over the 30-year period as were more recent exams." The study concluded that vital capacity falls 9 percent to 27 percent each decade depending on age, sex and the time the test is given. The study's shortcoming was in suggesting that vital capacity cannot be maintained and or increased, even in severe cases of chronic obstructive pulmonary disease.

Any opera (not necessarily voice) teacher will support the idea that breathing volume can be increased. Yet activities such as singing or sports are no guarantee of optimal breathing. In fact, they can even invite breathing blocks from gasping, forcing the exhale and breath heaving. You don't have to learn how to sing to have a huge pair of lungs. But you DO need to know how to breathe. I maintain that if you train someone to breathe correctly, they will naturally know how to sing. I have never seen it fail.

You can get the complete Framingham study at the National Institute of Health's Database. http://www.ncbi.nlm.nih.gov/PubMed/

REMINDER:

Most of scientific research is and was done with rats and primates who do not breathe the same as humans. Researchers did not seem to believe at that time that one could improve one's breathing. Many still do not believe one can improve one's breathing. This is simply not true. Recommended program

***Friday**, November 9, 2001*

The 53-year-old Framingham Heart & Lung Study whose breakthrough findings have led millions of Americans to change the way they live has begun recruiting its third generation of participants.

Letters were sent out Wednesday and Thursday to the grandchildren of the original participants, inviting them to continue in the footsteps of their parents and grandparents and take part in the longest epidemiological project in medicine.

The Framingham study is funded by the National Heart, Lung and Blood Institute and staffed largely by doctors from Boston University. It began in the Boston suburb of Framingham in 1948.

Among the study's findings: a link between cigarette smoking and heart disease, the risk of high cholesterol, the dangers of obesity, the benefits of exercise and the dangers of high blood pressure.

More than 10,000 people have participated in the study. Its organizers hope to recruit about 3,500 more from the third generation.

Volunteers agree to extensive physical exams every three or four years. They also provide information about their eating and living habits.

In return, they get thousands of dollars in free tests and a chance to be part of research that has already produced most of what is known about the causes of heart attacks and strokes.

Adults as young as 20 will be added to a sample with people as old as 90, enabling researchers to chart family risk factors like obesity, high cholesterol, diabetes and asthma through the generations and perhaps determine the role played by genetics and lifestyle in various diseases.

2. 29 years after the Framingham study, the same conclusions prevail.

Lung Function May Predict Long Life Or Early Death

How well your lungs function may predict how long you live. This finding is the result of a nearly 30-year follow-up of the association between impaired pulmonary function and all causes of mortality, conducted by researchers at the University at Buffalo. Results of the study appear in the September issue of Chest.

The purpose of the current study was to investigate the association between pulmonary function and mortality for periods that extended past 25 years, the limit of previous studies. Dr. SchÃ¼nemann and colleagues also wanted to determine for how long pulmonary function is a significant predictor of mortality.

Results showed that lung function was a significant predictor of longevity in the whole group for the full 29 years of follow-up. "It is important to note that the risk of death was increased for participants with moderately impaired lung function, not merely those in the lowest quintile," Dr. Schanemann said. "This suggests that the increased risk isn't confined to a small fraction of the population with severely impaired lung function."

The reasons lung function may predict mortality are not clear, Dr. Schunemann said, noting that increased risk is found in persons who never smoked, as well as among smokers.

"The lung is a primary defense organism against environmental toxins. It could be that impaired pulmonary function could lead to decreased tolerance against these toxins. Researchers also have speculated that decreased pulmonary function could underlie an increase in oxidative stress from free radicals, and we know that oxidative stress plays a role in the development of many diseases."

Dr. Schanemann said the fact that a relationship does exists between lung function and risk of death should motivate physicians to screen patients for pulmonary function, even if more research is needed to determine why.

"It is surprising that this simple measurement has not gained more importance as a general health assessment tool," he noted.

Schunemann HJ, Dorn J, Grant BJB, Winkelstein W, Jr., Trevisan M. Pulmonary Function Is a Long-term Predictor of Mortality in the General Population 29-Year Follow-up of the Buffalo Health Study. Chest 2000;118(3)656-664.

From Mike: "Surprising" puts it mildly! Recommended program

3. Decline in FEV1 (breathing volume) by age and smoking status: facts, figures and fallacies. Thorax 1997 52:820-827.

This study shows the importance of longitudinal studies as opposed to cross sectional ones."

This published article focused on a compilation of 83 published reports and clinical studies showing clearly that the primary measurement for lung function -FEV1 - is based on cross sectional data instead of longitudinal data. This means essentially that they include sick people with widely diverse circumstances in their statistics and compile everyone's data for mass diagnosis.
This 1997 research paper points out that; (italics mine) "from one low measurement of FEV1 (forced exhalation volume) in an adult, it is impossible to determine whether the reduced lung function is due to not having achieved a high maximum during early adulthood, or to having an accelerated rate of decline or to any combination of these." "Western medical studies, via cross sectioning, continue to look for role modeling epidemiological "norms" that include the ranks of the ill. Cross sectioning is 60% effective and proven by many to be ineffective over the last 40 years."
The health professional's opinion can have immense personal, social, legal, and economic consequences. When it is based on information colored by sick or otherwise non-optimum healthy or inappropriately chosen individuals, the statistic(s) become weighted in favor of, or excessively influenced by, illness or what is perceived as illness, and may well be in reality, simple mechanical dysfunction. Cross sectional studies can bring the averages down and cause many who do not need the intensity, duration or style of treatment recommended by many health practitioners to be over or under medicated, or inappropriately fed, exercised, massaged or educated.
From Mike:
We need to focus on how to improve breathing, not on how it became impaired. Dwelling too much on problems and pathology gets in the way of creativity and flexibility.
Recommended program

4. The von Ardenne studies focused on oxygen's relationship to most major categories of illness. When your blood oxygen goes way down, you get sick, die or at least shorten your life span. This book is a masterful compilation of clinical insights and variations on breathing assessments, cofactors and some techniques of breathing development called Oxygen Multistep Therapy Dr. Manfred von Ardenne was a student of Dr. Otto Warburg. Warburg received the 1931 Nobel Prize for proving that cancer is anaerobic; it cannot survive in a high oxygen environment. Germs, fungi and bacteria are anaerobic as well. von Ardenne was also inspired by Karl Lohmann who discovered adenosine triphosphate, ATP, which many believe to be the human bodyâ€™s main energy currency. von Ardenne was an electron physicist who in addition to his interest in astronomy, developed quite a good reputation for cancer research . He went on to develop a process he called Oxygen Multistep Therapy. In his book of the same name Dr. von Ardenne addressed some 150 respiratory and blood gas aspects including elements of what we might call respiratory psychophysiology.

Some studies addressed in the book are:
Dependence of O2 uptake at rest.
The O2 deficiency pulse reaction as a warning sign of a life-threatening crisis, and the lasting remedying of the crisis.
Procedures that influence and measure increases and decreases in arterial and venous O2 blood levels.
The necessary physical exercise to attain a training effect (which is less than you might expect).
Increases in brain circulation during physical strain.
Rate of blood flow in the circulation of the organs.
Various examples in changes of O2 uptake. Heart minute volume and blood flow of the organs decisive for O2 transport.
Relation of ATP concentrations in rat brains as a function of the oxygen partial pressure of the inspired air.
He graphed much of his research. Other cofactors that influence lung volume are airways hyper-responsiveness, atopy, childhood respiratory infections, air pollution, posture, subluxation of the spine, exercise, deep and superficial fascia, nutrition, occupational hazards, abuse and trauma, attitude, and age, height, weight and sex.
The Manfred von Ardenne studies are best obtained by getting his book called Oxygen Multistep Therapy. His material is good but remains primarily within the illness model instead of the wellness model.

5. OBESITY AND BREATHING
Effects of Obesity on Respiratory Resistance (increased force required to breathe and shortness of breath). Chest 1993 May,103(5):1470-1476. These findings suggest that in addition to the elastic load, obese subjects have to overcome increased respiratory resistance from the reduction in lung volume related to being overweight. Recommended program

6. Numerous measurements have shown that the low pO2art resulting from stressful events of following degeneration of the lung heart system (LHS) in old age can be re-elevated up to high values. Manfred von Ardenne - Stress 1981 Vol 2 Autumn. Recommended program

7. Self-evaluation of respiratory deterioration was significantly predictive of death from all causes. Kauffmann F, Annesi I, Chwalow J -Epidemiological Research Unit INSERM U 169, Villejuif, France. European Respiratory Journal 1997 Nov; 10(11):2508-2514 In other words there are ways of your telling yourself how good your breathing is and what you observe is related to how long you may live due to good or bad breathing.
From Mike: http://www.breathing.com/tests.htm
8. Breathe Well Be Well. Robert Fried, Ph D. A strong collection of 18 years working with correlating hyperventilation and its relationship to many illnesses never before linked to poor breathing.

9. Dr. Otto Warburg received the 1931 Nobel price for proving that cancer is anaerobic. It does not survive in high concentrations of oxygen.
MORE HEALTHY BREATHING COFACTORS
HOW IS THE FOLLOWING RELATED TO WARBURG?
A crucially important factor in breathing is the exhale, which is longer than the inhale. But contemporary lung volume measurements are inconsistent and guided by

cross sectional criteria instead of longitudinal data and therefore do not adequately predict decline within individuals.
This lack of insight about optimal functioning can cause people to be trained to do forced inhalations that may actually be harmful in long run.
Dr. Warburg and cancer. Cancer all other diseases, has countless secondary causes. But, even for cancer, there is only one prime cause. Summarized in a few words, the prime cause of cancer is the replacement of the respiration of oxygen in normal body cells by a fermentation of sugar. All normal body cells meet their energy needs by respiration of oxygen, whereas cancer cells meet their energy needs in great part by fermentation. All normal body cells are thus obligate aerobes, whereas all cancer cells are partial anaerobes. From the standpoint of the physics and chemistry of life this difference between normal and cancer cells is so great that one can scarcely picture a greater difference. Oxygen gas, the donor of energy in plants and animals is dethroned in the cancer cells and replaced by an energy yielding reaction of the lowest living forms, namely, a fermentation of glucose. Cancer cells can survive in low oxygen environments. More about cancer
http://www.breathing.com/articles/cancer.htm

10. Birmingham assessment of breathing study (BABS).

BACKGROUND: Current international resuscitation guidelines for lay people rely on the assessment of "normal breathing" as a key sign of breathing and circulation. However, it is not known how accurately laypersons can discriminate between "normal" and "abnormal" breathing. The aim of this study was to test the ability of medical students to discriminate between simulated normal and abnormal breathing patterns and select the correct treatment. METHODS: Six video clips of simulated breathing were recorded showing: normal; abnormal -shallow, rapid, agonal (obstructed and unobstructed airways); or absent breathing. The clips were validated by three experienced emergency practitioners and then shown in a random order to 48 second-year medical students. For each clip observers were asked to indicate: "Is this patient breathing?" (yes-normal, yes-abnormal, no) and "What action would you take?" (rescue breathing or recovery position). RESULTS: All experts correctly identified the breathing type and agreed on an appropriate emergency action. Students identified normal breathing as: normal 61%, abnormal 33% and absent 6%; abnormal breathing as: normal 29%, abnormal 61%, absent 10%; and absent breathing as: normal 8%, abnormal 6%, absent 85%. Correct actions were selected in 86% during normal breathing, 51% during abnormal breathing and 86% during absent breathing. The sensitivity for observers correctly identifying normal from abnormal breathing was 60% and specificity 75% and for selecting the correct action was 42% and 80%, respectively. **CONCLUSIONS:** Medical students were unable to identify normal breathing from abnormal breathing reliably resulting in a high number of inappropriate, potentially harmful actions. Further evaluation of the optimal method for assessing for signs of breathing and circulation is required.
Publication Types: Evaluation Studies

Keywords: abnormal breathing, normal breathing, absent breathing, medical students, from abnormal, discriminate between, breathing, normal, abnormal, absent, students, action, medical, correct
Authored by Perkins GD, Stephenson B, Hulme J, Monsieurs KG. Division of Medical Sciences, University of Birmingham, Birmingham B152TT, UK.
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11. One of the Reasons we like slower breathing rates.

Slow breathing reduces chemoreflex response to hypoxia and hypercapnia, and increases baroreflex sensitivity.

OBJECTIVE: To investigate whether breathing more slowly modifies the sensitivity of the chemoreflex and baroreflex. DESIGN SETTING: University of Pavia, IRCCS Policlinico S. Matteo. PARTICIPANTS: Fifteen healthy individuals. INTERVENTIONS: Progressive isocapnic hypoxia and progressive hyperoxic hypercapnia were measured during spontaneous breathing and during a breathing rate fixed at 6 and 15 breaths per minute (b.p.m.). Main outcome measures: Variations in chemo- and baroreflex sensitivity (by monitoring ventilation, oxygen saturation, end-tidal carbon dioxide, R-R interval and blood pressure) induced by different breathing rates. RESULTS: Breathing at 6 b.p.m. depressed ($P < 0.01$) both hypoxic and hypercapnic chemoreflex responses, compared with spontaneous or 15 b.p.m. controlled breathing. Hypoxic and hypercapnic responses during spontaneous breathing correlated with baseline spontaneous breathing rate ($r = -0.52$ and $r = +0.51$, respectively; $P = 0.05$). Baroreflex sensitivity was greater ($P < 0.05$) during slow breathing at baseline and remained greater at end rebreathing. **CONCLUSIONS**: Slow breathing reduces the chemoreflex response to both hypoxia and hypercapnia. Enhanced baroreflex sensitivity might be one factor inhibiting the chemoreflex during slow breathing. A slowing breathing rate may be of benefit in conditions such as chronic heart failure that are associated with inappropriate chemoreflex activation.

Keywords: slow breathing, baroreflex sensitivity, breathing rate, spontaneous breathing, during slow, during spontaneous, breathing, chemoreflex, spontaneous, baroreflex, sensitivity
Authored by Bernardi L, Gabutti A, Porta C, Spicuzza L. Department of Internal Medicine, University of Pavia and IRCCS Ospedale S. Matteo, Pavia, Italy.
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Our recommendation. Fundamentals ALL plus Diaphgram Strengthener.

12. "Systems" disorder. More evidence for a holistic approach.
Mathematical models of periodic breathing and their usefulness in understanding cardiovascular and respiratory disorders.

Periodic breathing is an unusual form of breathing with oscillations in minute ventilations and with repetitive apnoeas or near apnoeas. Reported initially in patients with heart failure or stroke, it was later recognized to occur especially during sleep. The recurrent hypoxia and surges of sympathetic activity that often occur during the apnoeas have serious health consequences. Mathematical models have helped greatly in the understanding of the causes of recurrent apnoeas. It is unlikely that every instance of periodic breathing has the same cause, but many result from instability in the feedback control involved in the chemical regulation of breathing caused by increased controller and plant gains and delays in information transfer. Even when it is not the main cause of the periodic breathing, unstable control modifies the ventilatory pattern and sometimes intensifies the recurrent apnoeas. The characteristics of disturbances to breathing and their interaction with the control system can be critical in determining ventilation responses and the occurrence of periodic breathing. Large abrupt changes in ventilation produced, for example, in the transition from waking to sleep and vice versa, or in the transition from breathing to apnoea, are potent factors causing periodic breathing. Mathematical models show that periodic breathing is a **'systems disorder'** produced by the interplay of multiple factors. Multiple factors contribute to the occurrence of periodic breathing in

congestive heart failure and cerebrovascular disease, increasing treatment options.

Keywords: periodic breathing, multiple factors, transition from, mathematical models, heart failure, recurrent apnoeas, breathing, periodic, apnoeas, factors, control, recurrent

Authored by Cherniack NS, Longobardo GS. New Jersey Medical School UMDNJ, 185 South Orange Avenue, PO Box 1709, Newark NJ 07101-1709, USA.
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13. Self-evaluation of respiratory deterioration was significantly predictive of death from all causes. Kauffmann F, Annesi I, Chwalow J -Epidemiological Research Unit INSERM U 169, Villejuif, France. European Respiratory Journal 1997 Nov; 10(11):2508-2514 . In other words there are ways of your telling yourself how good your breathing is and what you observe is related to how long you may live due to good or bad breathing. The Breathing Tests, OB Breathing Skills, UDB check sheet and Breathing Awareness check sheet in the 4 Week program are our choices for this.

14. The role of inspiratory muscle function (we use our Diaphragm Strengthener and singing exercises in the OBV) and training in the genesis of dyspnoea in asthma and COPD.

IMT offers a relatively accessible non-pharmacological treatment for dyspnoea that also improves exercise tolerance and quality of life.

Authored by McConnell AK. Sport Sciences Department, Brunel University, Uxbridge, Middlesex UB8 3PH, UK.

15. Possible Non invasive method of measuring diaphragm development.
Diaphragm Paralysis Definitively Diagnosed by Ultrasonography and Postural Dependence of Dynamic Lung Volumes after Seven Decades of Dysfunction.

Unilateral diaphragm paralysis is an important and often unrecognized cause of dyspnea. In patients with appropriate risk factors, such as prior head and neck surgery and presentation of positional dyspnea or dyspnea on submersion, unilateral diaphragmatic paralysis should be considered. We present our approach to the diagnosis of diaphragm paralysis and demonstrate the utility of upright/supine spirometry and M-mode ultrasonography in these patients' evaluation

Keywords: diaphragm paralysis, dyspnea, paralysis

Authored by Patel AS, O'donnell C, Parker MJ, Roberts DH. Beth Israel Deaconess Medical Center and Harvard Medical School, Boston, Massachusetts, USA

16. Breathing Resistance training such as with the Diaphgram Strengthener not only develops the diaphragm but other muscles as well.
The influence of inspiratory muscle work history and specific inspiratory muscle training upon human limb muscle fatigue.

The purpose of this study was to assess the influence of the work history of the inspiratory muscles upon the fatigue characteristics of the plantar flexors (PF). We hypothesized that under conditions where the inspiratory muscle metaboreflex has been elicited, PF fatigue would be hastened due to peripheral vasoconstriction. Eight volunteers undertook seven test conditions, two of which followed 4 week of inspiratory muscle training (IMT). The inspiratory metaboreflex was induced by inspiring against a calibrated flow resistor. We measured torque and EMG during isometric PF exercise at 85% of maximal voluntary contraction (MVC) torque. Supramaximal twitches were superimposed upon MVC efforts at 1 min intervals (MVC(TI)); twitch interpolation assessed the level of central activation. PF was terminated (T(lim)) when MVC(TI) was <50% of baseline MVC. PF T(lim) was significantly shorter than control (9.93 +/- 1.95 min) in the presence of a leg cuff inflated to 140 mmHg (4.89 +/- 1.78 min; P = 0.006), as well as when PF was preceded immediately by fatiguing inspiratory muscle work (6.28 +/- 2.24 min; P = 0.009). Resting the inspiratory muscles for 30 min restored the PF T(lim) to control. After 4 weeks, IMT, inspiratory muscle work at the same absolute intensity did not influence PF T(lim), but T(lim) was significantly shorter at the same relative intensity. The data are the first to provide evidence that the inspiratory muscle metaboreflex accelerates the rate of calf fatigue during PF, and that IMT attenuates this effect.

Keywords: inspiratory muscle, muscle work, significantly shorter, muscle metaboreflex, inspiratory muscles, inspiratory, muscle, metaboreflex, fatigue

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Our recommendation http://www.breathing.com/ds.htm

17. Detecting Hidden Breathing Related Disorders

The prevalence of dysfunctional breathing in adults in the community with and without asthma.

Functional breathing problems, including symptomatic hyperventilation, may impair quality of life. Symptoms associated with functional breathing disorders have been reported as being common in secondary care settings, and can affect 29% of adults with current asthma in the community. The prevalence of dysfunctional breathing in the general adult population is unknown. The Nijmegen Questionnaire has been reported to have useful sensitivity and specificity for diagnosing dysfunctional breathing. A cross-sectional postal survey of adults without current asthma was undertaken in a single UK general practice. The results were analysed in conjunction with a previously described survey of adults with current asthma from the same population. The questionnaire was posted to a random sample of 300 people aged 16-65 without current asthma, and 69% were returned. 8% (95% confidence intervals 4-12%) had positive screening scores. Positive screening scores were more common in women (14%, 7-20%) than men (2%, 0-5%, p=0.003). Comparison with the previous survey showed that the prevalence of positive screening scores was higher in those with current asthma than those without (29% vs. 8%, p<0.001). Dysfunctional breathing may affect up to one in 10 people, and is more common in women and in people with asthma.

Keywords: current asthma, screening scores, positive screening, dysfunctional breathing, with current, adults with, more common, without current, been reported, functional breathing, asthma, breathing, current, positive, scores, screening, people, dysfunctional, common, adults, survey

Authored by Thomas M, McKinley RK, Freeman E, Foy C, Price D. GPIAG Clinical Research Fellow, Department of General Practice and Primary Care, University of Aberdeen, UK

From Mike: they say it is 10%. We believe it is a lot closer to 80% but at least they are alluding to the possibility of problems yet to be diagnosed. See www.breathing.com/articles/udb.htm

18. Inspiratory muscle training: integrative review.

This article provides a critical review of inspiratory muscle training (IMT) in chronic obstructive pulmonary disease (COPD). Although extensive research on IMT has accumulated, its benefits have been debated, primarily because of methodological limitations of studies. Using relevant key words, multiple databases were searched from 1966. Selected studies used PImax (maximal inspiratory pressure) as an outcome variable. Overall, research demonstrated that a standard protocol of 30% or higher for a duration of 20 to 30 minutes per day for 10 to 12 weeks improves dyspnea and inspiratory strength and endurance with either inspiratory resistive or inspiratory threshold training. Regardless of method, IMT protocols for people with COPD and inspiratory muscle weakness and dyspnea are generally safe, feasible, and effective. Patient selectivity and study of subgroups are recommended.*Our recommendation* *http*://www.breathing.com/ds.htm

Keywords: inspiratory muscle, inspiratory
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19. This refers to the wisdom of moderation in exercise and another reason I do not like the cardiac stress test being so severe.

Fatiguing inspiratory muscle work causes reflex reduction in resting leg blood flow in humans.|

1. We recently showed that fatigue of the inspiratory muscles via voluntary efforts caused a time-dependent increase in limb muscle sympathetic nerve activity (MSNA) (St Croix et al. 2000). We now asked whether limb muscle vasoconstriction and reduction in limb blood flow also accompany inspiratory muscle fatigue. 2. In six healthy human subjects at rest, we measured leg blood flow (.Q(L)) in the femoral artery with Doppler ultrasound techniques and calculated limb vascular resistance (LVR) while subjects performed two types of fatiguing inspiratory work to the point of task failure (3-10 min). Subjects inspired primarily with their diaphragm through a resistor, generating (i) 60 % maximal inspiratory mouth pressure (P(M)) and a prolonged duty cycle (T(I)/T(TOT) = 0.7); and (ii) 60 % maximal P(M) and a T(I)/T(TOT) of 0.4. The first type of exercise caused prolonged ischaemia of the diaphragm during each inspiration. The second type fatigued the diaphragm with briefer periods of ischaemia using a shorter duty cycle and a higher frequency of contraction. End-tidal P(CO2) was maintained by increasing the inspired CO(2) fraction (F(I,CO2)) as needed. Both trials caused a 25-40 % reduction in diaphragm force production in response to bilateral phrenic nerve stimulation. 3. .Q(L) and LVR were unchanged during the first minute of the fatigue trials in most subjects; however, .Q(L) subsequently decreased (-30 %) and LVR increased (50-60 %) relative to control in a time-dependent manner. This effect was present by 2 min in all subjects. During recovery, the observed changes dissipated quickly (< 30 s).

Mean arterial pressure (MAP; +4-13 mmHg) and heart rate (+16-20 beats min(-1)) increased during fatiguing diaphragm contractions. 4. When central inspiratory motor output was increased for 2 min without diaphragm fatigue by increasing either inspiratory force output (95 % of maximal inspiratory pressure (MIP)) or inspiratory flow rate (5 x eupnoea), .Q(L), MAP and LVR were unchanged; although continuing the high force output trials for 3 min did cause a relatively small but significant increase in LVR and a reduction in .Q(L). 5. When the breathing pattern of the fatiguing trials was mimicked with no added resistance, LVR was reduced and .Q(L) increased significantly; these changes were attributed to the negative feedback effects on MSNA from augmented tidal volume. 6. Voluntary increases in inspiratory effort, in the absence of diaphragm fatigue, had no effect on .Q(L) and LVR, whereas the two types of diaphragm-fatiguing trials elicited decreases in .Q(L) and increases in LVR. We attribute these changes to a metaboreflex originating in the diaphragm. Diaphragm and forearm muscle fatigue showed very similar time-dependent effects on LVR and .Q(L). Publication Types: Research Support, U.S. Gov't, P.H.S

Keywords: time dependent, diaphragm fatigue, force output, fatiguing trials, these changes, were unchanged, duty cycle, limb muscle, blood flow, muscle fatigue, maximal inspiratory, diaphragm, inspiratory, fatigue, subjects, trials, increased, fatiguing, muscle, caused, changes, force, output, pressure, reduction, maximal, types, dependent

Authored by Sheel AW, Derchak PA, Morgan BJ, Pegelow DF, Jacques AJ, Dempsey JA. Department of Population Health Sciences, John Rankin Laboratory of Pulmonary Medicine, University of Wisconsin-Madison, Madison, WI, USA. bill.sheel@ubc.caA

20. Points to the wisdom of practicing some kind of warm up. We recommend our OB Fundamentals exercises) prior to strenuous exercise.

Effect of specific inspiratory muscle warm-up on intense intermittent run to exhaustion.

The effects of inspiratory muscle (IM) warm-up on the maximum dynamic IM function and the maximum repetitions of 20-m shuttle run (Ex) in the Yo-Yo intermittent recovery test were examined. Ten men were recruited to perform identical IM function test and exercise test in three different trials randomly. The control trial was without IM warm-up while the placebo and experimental trials were with IM warm-up by performing two sets of 30 breaths with inspiratory pressure-threshold load equivalent to 15% (IMW(P)) and 40% (IMW) maximum inspiratory mouth pressure, respectively. In IMW, maximum dynamic IM functions including the maximal inspiratory pressure at zero flow (P0) and maximal rate of P0 development (MRPD) were increased compared with control values ($P < 0.05$). The Ex was also augmented [mean (SD)] [19.5% (12.6)] while the slope of the linear relationship of the increase in rating of perceived breathlessness for every 4th exercise interval (RPB/4i) was reduced ($P < 0.05$). In IMW(P), although increase in Ex and reduction in RPB/4i were occurred concomitantly in some subjects, the differences in Ex, RPB/4i and dynamic IM functions between control and IMW(P) trials were not statistically significant. For the changes (Delta) in parameters in IMW and IMW(P) ($n = 20$), negative correlations were found between Delta RPB/4i and Delta Ex ($r = -0.92$), DeltaP0 and Delta RPB/4i ($r = -0.48$), and Delta MRPD and Delta RPB/4i ($r = -0.54$). Such findings suggested that the specific IM warm-up in IMW may entail reduction in breathlessness sensation, partly attributable to the enhancement of dynamic IM functions, in subsequent exhaustive intermittent run and, in turn, improve the exercise tolerance. Publication Types: Randomized Controlled Trial

Keywords: inspiratory pressure, trials were, maximum dynamic, delta, inspiratory, dynamic, maximum, functions, pressure, trials, exercise, control

Authored by Tong TK, Fu FH. Dr. Stephen Hui Research Centre for Physical Recreation and Wellness, NAB210, L2, David C. Lam Building Shaw Campus, Hong Kong Baptist University, Kowloon Tong, Hong Kong, China. tongkk@hkbu.edu.|

21. Points to the wisdom of use several factors to assess optimal breathing. Our recommendation is the Optimal Breathing Skills.
The Value of Multiple Tests of Respiratory Muscle Strength.

BACKGROUND: Respiratory muscle weakness is an important clinical problem. Tests of varying complexity and invasiveness are available to assess respiratory muscle strength. The relative precision of different tests in the detection of weakness is less clear, as is the value of multiple tests. Methods & PATIENTS: We analyzed the respiratory muscle function tests of clinical referrals who had multiple tests assessed in our laboratories over a 6 year period. Thresholds for weakness for each test were determined from published and in-house laboratory data. The patients were divided into three groups; those who had all relevant measurements of global inspiratory muscle strength (group A, n=182), those with full assessment of diaphragm strength (group B, n=264), and those for whom expiratory muscle strength was fully evaluated (group C, n=60). We studied the diagnostic outcome of each inspiratory, diaphragm and expiratory muscle test, both singly and in combination, and calculated the impact of using more than one test to detect weakness. RESULTS: The clinical referrals were primarily for the evaluation of neuromuscular diseases and dyspnoea of unknown cause. A low maximal inspiratory mouth pressure (PImax) was recorded in 40.1% of referrals in group A, while a low sniff nasal pressure (Sniff Pnasal) was recorded in 41.8% and a low sniff oesophageal pressure (Sniff Poes) in 37.9%. When assessing inspiratory strength with the combination of all three tests 29.6% of patients had weakness. Using the two non-invasive tests, PImax and Sniff Pnasal, in combination we obtained a similar result (low in 32.4%). Combining Sniff Pdi (low in 68.2%) and Twitch Pdi (low in 67.4%) reduced the diagnoses of patients with diaphragm weakness to 55.3% in group B. 38.3% of the patients in group C had expiratory muscle weakness as measured by PEmax, compared to 36.7% when weakness was diagnosed by cough Pgas, and 28.3% when assessed by Twitch T10. Combining all three expiratory muscle tests reduced the number of patients diagnosed as having expiratory muscle weakness to 16.7%. **CONCLUSION**: The use of single tests, such as PImax, PEmax and other available individual tests of inspiratory, diaphragm and expiratory muscle strength, tend to overdiagnose weakness. Combinations of tests increase diagnostic precision, and in the population studied they reduced the diagnosis of inspiratory, specific diaphragm, and expiratory muscle weakness by 19 - 56%. Measuring both PImax and Sniff Pnasal resulted in a relative reduction of 19.2% of patients falsely diagnosed with inspiratory muscle weakness. The addition of Twitch Pdi to Sniff Pdi increased diagnostic precision by a smaller amount, 18.9%. Having multiple tests of respiratory muscle function available both increases diagnostic precision, and makes assessment possible in a range of clinical circumstances.

Keywords: expiratory muscle, muscle weakness, respiratory muscle, muscle strength, sniff pnasal, diagnostic precision, multiple tests, pressure sniff, inspiratory diaphragm, inspiratory muscle, muscle function, clinical referrals, strength group, muscle, tests, weakness, sniff, expiratory, patients, inspiratory, group, strength, diaphragm, precision, diagnostic, clinical, respiratory, pimax, diagnosed, pnasal,

reduced, twitch, available, multiple, referrals, three, combination, pressure

Authored by Steier J, Kaul S, Seymour J, Jolley C, Rafferty GF, Man WD, Luo Y, Roughton M, Polkey MI, Moxham J. King's College Hospital, United Kingdom.

22. Oxygenation improved by inspiratory muscle training.

Effects of inspiratory muscle training on exercise responses in normoxia and hypoxia.

The purpose of this study was to determine the effects of inspiratory muscle training (IMT) on exercise in hypoxia (H) and normoxia (N). A 4-week IMT program was implemented with 12 healthy subjects using an inspiratory muscle trainer set at either 15% (C; n=5) or 50% (IMT; n=7) maximal inspiratory mouth pressure (PI(max)). Two treadmill tests (85% V O(2max)) to exhaustion and measures of diaphragm thickness (T(di)) and function were completed before and after training in H and N. Significant increases of 8-12% and 24.5+/-3.1% in T(di) and PI(max), respectively, were seen in the IMT group. Time to exhaustion remained unchanged in all conditions. Inspiratory muscle fatigue (downward arrowPI(max)) following exercise was reduced approximately 10% (P<0.05) in IMT after both N and H. During H, IMT reduced (P<0.05) V O(2) by 8-12%, cardiac output by 14+/-2%, ventilation by 25+/-3%; and increased arterial oxygen saturation by 4+/-1% and lung diffusing capacity by 22+/-3%. Ratings of perceived exertion and dyspnea were also significantly reduced. These data suggest that IMT significantly improves structural and functional physiologic measures in hypoxic exercise.

Keywords: inspiratory muscle, inspiratory, reduced, muscle, exercise

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Our recommendation. http://www.breathing.com/ds.htm

23. Another reason we like 5 breaths a minute instead of 10-14.
Effect of deep breathing at six breaths per minute on the frequency of premature ventricular complexes.

Although the effect of reflex increase in vagal tone on the frequency of premature ventricular complexes (PVC) is known, the effect of timed deep breathing on the frequency of PVC has not been reported. We serendipitously discovered that deep breathing at six breaths per minute abolished PVC in an 18-year-old female with frequent PVC, anxiety, and palpitations. In five of a series of 10 consecutive patients with frequent (> or = 10/min) unifocal PVC, deep breathing at 6 breaths/min reduced the frequency of PVC by at least 50%. This is possibly due to increased vagal modulation of sinoatrial and atrioventricular node. However, factors predicting the response to deep breathing, and the mechanisms involved need to be studied in a larger number of patients. Publication Types: Letter, Research Support, Non-U.S. Gov't

Our recommendation. Fundamentals ALL plus Diaphragm Strengthener.

Keywords: deep breathing, with frequent, breathing, frequency

Authored by Prakash ES, Ravindra PN, Madanmohan, Anilkumar R, Balachander J.

24. Breathe Well Be Well. Robert Fried, Ph D. A strong collection of 18 years working with correlating hyperventilation and its relationship to many illnesses never before linked to poor breathing.

25. Breathing Pattern Retraining and Exercise in Persons with Chronic Obstructive Pulmonary Disease

"Smaller breaths conserve energy in the short term but contribute to respiratory muscle fatigue and hyperinflation as the work of exercise increases or is prolonged."

"A properly designed breathing retraining program in which patients with COPD learn to control their pattern of breathing under the stress of performing different modes of exercise at increasing intensity and duration may markedly decrease dyspnea and improve gas exchange."

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Do you often catch yourself not breathing?
Do you experience shallow, labored breathing; shortness of breath; a high chest; stuck, erratic, or reverse breathing?
Are you unable to catch your breath?
Do you have blue-tinted lips or fingernails; trouble sleeping; more than 6 -8 resting breaths per minute with 3-6 second pauses; heart beat irregularities; poor posture, mild to severe depression; tightness across your chest; excessive stress; asthma or COPD symptoms; constant fatigue; chronic pain; chest pains; anger; anxiety; hyperventilation?
Do you think you can't sing or want to sing better?
For more breathing-relevant studies in a free newsletter or to take the free breathing self tests and see how you compare to others, access www.breathing.com/tests.htm

[Testimonials]

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