Normal Breathing: the Key to Vital Health

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Breathing Retraining Manual
(Instructional Guide)

Amazing DIY Breathing Device

Simplified theory and practice of breathing, body oxygenation, chronic diseases and breathing retraining

“All chronic pain, suffering and diseases are caused from a lack of oxygen at the cell level."

Arthur C. Guyton, The Textbook of Medical Physiology*, Fifth Edition.

** World’s most widely used medical textbook of any kind*
** World's best-selling physiology book*

Content of the manual
“Amazing DIY Breathing Device”

Introduction

Hundreds of medical studies have proved that when we breathe more than the medical norm (hyperventilate), we get less oxygen into our body cells. At the same time, virtually all chronic diseases are based on cellular hypoxia. All available research has also shown that sick people (heart disease, cancer, asthma, bronchitis, COPD, diabetes, and many other chronic conditions) breathe about 2-3 times more than the medical norm. Hence, the solution is to learn how to breathe less.

Dr. Konstantin Buteyko developed a method (the Buteyko breathing method) to normalize one's breathing pattern so that the person learns how to breathe less. As a result of breathing retraining, they experience relief from their symptoms and require less and less medication. Normalization of breathing, as Dr. Buteyko and about 200 his medical colleagues from the former USSR found, means normal body oxygenation and clinical remission of many chronic diseases.

I have been teaching the Buteyko method to hundreds of students, mostly in small groups, during the last 7 years. When Buteyko students improve their body oxygenation or CP (control pause), their health is indeed improved. Over 20 second CP means no symptoms and no medication for hypertension, asthma, bronchitis, and many other conditions. However, the main disadvantage of the Buteyko method is that very few people (less than 1% of the sick people) are able to learn the Buteyko breathing exercises from a book or manual. Dr. Buteyko discovered this fact himself already in the 1960s and that is why he started to teach practitioners by choosing and training sick doctors.

This disadvantage (necessity of the practitioner or teacher) can be solved using a simple DIY breathing device. How? It is much easier to practice breathing exercises correctly using this DIY breathing device. Although, there are still restrictions, limits, and temporary contraindications, sick people can get a chance to have a better life, and this without learning it from a breathing teacher.

In 2009-2010, apart from teaching the Buteyko breathing exercises (reduced breathing) to groups, I also made numerous breathing devices for my students and explained to them how to use these devices. Weeks later I asked these students about their experiences and the efficiency of the DIY devices. The following facts were discovered:
1) My students were able increase their body oxygenation by as much as 5-15 seconds during one breathing session of about 15 minutes.
2) They got greater CP increases in comparison to Buteyko breathing exercises of the same duration.
3) They reported that it was much easier to practice with the device and they achieved more benefits from using the DIY breathing device.
4) However, when these students got up to 30-40 second CP, they usually preferred the reduced breathing exercises developed by Dr. K. Buteyko, since the Buteyko exercises do not require any device and can be practiced anywhere and/or at any time of the day, while being involved in other activities.

I still continue to teach both, the Buteyko breathing exercises and the use of the DIY breathing device, since each approach has its advantages. They greatly complement each other. Although I ask my students to practice both types of exercises during the course, I leave it up to my students to decide which exercises they want to practice after the course, this based on their own intuition, sensations, and recorded experience (their daily logs).

On average, for the initial stages of breathing retraining, the DIY breathing device is about 40-60% more efficient, in terms of CP (oxygenation) growth, than the typical session of Buteyko reduced breathing of the same duration. In addition, since it is easy to learn and practice, I have decided to share this idea with you.

Who can use this manual

Normal breathing is a fundamental property of the healthy organism. Hence, breathing normalization is the natural way to deal with human body pathologies. While people with cardiovascular, lung, and some other problems require a different approach (see the next sections), this manual can and should be successfully used by people who suffer from any of these symptoms, disorders, and conditions and their combinations:
Bones, Joints & Muscles Conditions (arthritis; back & neck pain; Carpal tunnel syndrome; chronic fatigue syndrome & fibromyalgia; elbow pain (bursitis); knee pain; muscular dystrophies; osteoarthritis; osteochondrosis; osteoporosis; polyarthritis; rheumatoid arthritis / joint conditions; radiculitis (nerve root syndrome); scoliosis)
Brain & Nervous System (ADD/ADHD; addictions; alcoholism; Alzheimer's disease; anxiety; bipolar disorder; carpal tunnel syndrome; depression; dizziness; eating disorders; encephalitis; epilepsy; obsessive-compulsive disorder; meningitis (viral and bacterial); motor neurone disease, Parkinson's disease; phobias; post traumatic stress disorder (PTSD); schizophrenia; senile dementia, social anxiety disorder; vertigo)
Cancer (stages 1 and 2; as an additional therapy for a standard complex treatment)
Eye disorders (cataracts; far-sightedness; glaucoma; macular degeneration)
Gastrointestinal problems (acute and chronic pancreatitis; cholecystitis; Crohn's disease; chronic gastritis; constipation; duodenal ulcer; gallstone disease; gastric ulcers; heartburn / GERD; hemochromatosis; IBS; IBD; liver cirrhosis; peptic ulcer; spastic colitis; weight loss)
Hormonal disorders (adrenal insufficiency; diabetes mellitus type 1; gestational diabetes; hyperthyroidism; hypothyroidism; prediabetes; reactive hyperglycemia and hypoglycemia; obesity)
Immune conditions (allergic conjunctivitis; allergies; dermatitis; hay fever; lupus; multiple chemical sensitivities)
Other conditions (anemia; cystic fibrosis; hemorrhoids; Raynaud's disease; thrombophlebitis; varicose veins)
Radiation disease
Sleep-related problems (bruxism, insomnia; restless leg syndrome; sleep apnoea; snoring)
Skin disorders (Acne; diathesis; eczema; psoriasis)
Upper respiratory disorders (sinusitis; rhinitis; adenoiditis; polyps; tonsillitis; laryngitis; pharyngitis; tracheitis and other related disorders
Urinary and kidney problems (pyelonephritis, glomerulonephritis, kidney stones; nephritis, nocturia; urinary incontinence; urinary tract infections)
Viral and bacterial conditions (AIDS (acquired immune deficiency syndrome); bird flu (Avian influenza); cellulitis (bacterial infection); cold; hepatitis A; hepatitis B; hepatitis C; influenza, Lyme disease; rubella (German measles); shingles; West Nile virus).
Women's conditions (cervical erosion; endometriosis; fibroids; fibromyomes; fibrotic mastopathy; irregularities of the menstrual cycle; menopause; sterility; toxicosis of pregnancy; yeast infections)

Note that it is impossible to provide a sensible classification of modern health problems ("diseases of civilization") due to overlaps and possible complex clinical pictures. The explanation for this is that modern medicine does not know the cause of these health problems. This manual suggests that all these conditions have one common cause. Hence, they are not separate disorders, but symptoms of one large disease, which we are going to investigate and address.

Who has special restrictions, limits, and temporary contraindications

Breathing retraining and breathing exercises produce a mild stress for the human body so that it can adapt to new conditions and function better in future. Such adaptive effects take place during, for example, physical exercise. It would be silly for an unfit person to try to run a marathon without rigorous preparation.

If the demands due to the exercises are too high, there is no adaptive response, and, as a result, the exercises can even produce a negative effect. Hence, breathing exercises should also be adjusted to the current adaptive abilities of the human organism. For example, people with existing cardiovascular and/or lung problems require certain modifications (individual tailoring) to their breathing retraining.

For example, a more gentle approach in relation to hypoxic and hypercapnic demands of breathing exercises (quick changes in air composition) is necessary for many patients with:
Heart disease (aortic aneurysms; angina pectoris; arrhythmia; atherosclerosis (plaque buildup); cardiomyopathy; ciliary arhythmia (cardiac fibrillation); chest pain (angina pectoris); high cholesterol; chronic ischemia; congenital heart disease; congestive heart failure; coronary artery disease; endocarditis; extrasystole; heart murmurs; hypertension; hypertrophic cardiomyopathy; tachnycardia; pericarditis; postmyocardial infarction; stroke)
Migraine headaches and panic attacks

Those people, who have existing problems with their lungs should avoid too fast and too large stretching (expansion or dilation) and shrinking (constriction) of their lungs. Hence, their inhalations and exhalations should be limited (not maximum) in their amplitude and velocity. This relates to people with:
Respiratory disorders involving the lungs (asthma, bronchitis, COPD, emphysema, cystic fibrosis, pneumonia, tuberculosis; pulmonary edema; etc.)

Other specific situations include:
Presence of transplanted organs
Pregnancy
Brain traumas
Acute bleeding injuries
Blood clots
Acute stages (exacerbations) of life-threatening conditions (infarct, stroke, cardiac ischemia, etc.)
Insulin-dependent diabetes (type 2 diabetes)
Loss of CO2 sensitivity

If you suffer from any of these conditions, you should follow special suggestions (see below) due to restrictions, limits, and temporary contraindications.

Warning. Consult your family physician or GP about breathing retraining and use of this breathing device and manual for your specific health problems.

1. What is wrong with the breathing of the sick?

1.1 Heart disease

Let us start with heart disease. Here are the results of 8 published independent medical studies about breathing rates (minute ventilation) in 8 groups of patients with heart disease. (The graphs are from the website.)

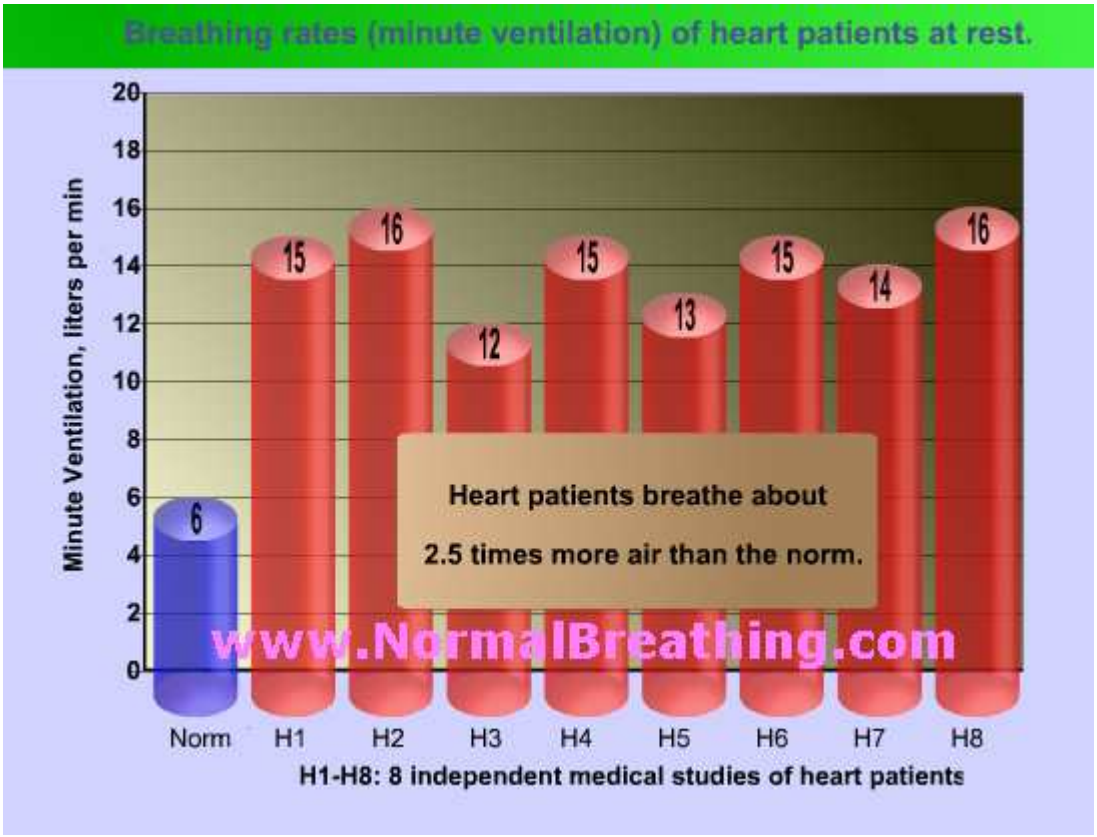

Table 1a. Prevalence of CHV (chronic hyperventilation) in patients with heart disease.
*One row corresponds to one medical study/publication

Condition	Minute ventilation	Number of patients	Prevalence of CHV	References
Normal breathing	**6 L/min**	-	0 %	Medical textbooks
Heart disease	**15 (±4) L/min**	22	100%	Dimopoulou et al, 2001
Heart disease	**16 (±2) L/min**	11	100%	Johnson et al, 2000
Heart disease	**12 (±3) L/min**	132	100%	Fanfulla et al, 1998
Heart disease	**15 (±4) L/min**	55	100%	Clark et al, 1997
Heart disease	**13 (±4) L/min**	15	100%	Banning et al, 1995
Heart disease	**15 (±4) L/min**	88	100%	Clark et al, 1995
Heart disease	**14 (±2) L/min**	30	100%	Buller et al, 1990
Heart disease	**16 (±6) L/min**	20	100%	Elborn et al, 1990

We can see that heart patients breathe too much. What is wrong with this?

If heart patients breathe more air than the medical norm, it is logical that their heart muscle gets less blood and oxygen supply (see explanation in the next section). Should these heart patients slow their breathing back to the norm, heart perfusion and oxygenation, state of blood vessels, and many other key parameters would again become normal. This would result in the disappearance of the symptoms of heart disease and no more need for medication.

References (in the same order)

Dimopoulou I, Tsintzas OK, Alivizatos PA, Tzelepis GE, Pattern of breathing during progressive exercise in chronic heart failure, Int J Cardiol. 2001 Dec; 81(2-3): p. 117-121.
Intensive Care Unit and Pulmonary Function Laboratory, Onassis Cardiac Surgery Center, Athens, Greece.

Johnson BD, Beck KC, Olson LJ, O'Malley KA, Allison TG, Squires RW, Gau GT, Ventilatory constraints during exercise in patients with chronic heart failure, Chest 2000 Feb; 117(2): p. 321-332.
Divisions of Cardiovascular Health, Department of Internal Medicine, Mayo Clinic and Foundation, Rochester, MN 55905, USA.

Fanfulla F, Mortara , Maestri R, Pinna GD, Bruschi C, Cobelli F, Rampulla C, The development of hyperventilation in patients with chronic heart failure and Cheyne-Stokes respiration, Chest 1998; 114; p. 1083-1090.
Respiratory Function Laboratory, IRCCS, S. Maugeri Foundation, Montescano Medical Center, Pavia, Italy.

Clark AL, Volterrani M, Swan JW, Coats AJS, The increased ventilatory response to exercise in chronic heart failure: relation to pulmonary pathology, Heart 1997; 77: p.138-146.
Departnent of Cardiac Medicine, National Heart and Lung Institute, London, UK.

Banning AP, Lewis NP, Northridge DB, Elbom JS, Henderson AH, Perfusion/ventilation mismatch during exercise in chronic heart failure: an investigation of circulatory determinants, Br Heart J 1995; 74: p.27-33.
Department of Cardiology, College of Medicine, University of Wales, Cardiff, UK.

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Department of Cardiac Medicine, National Heart and Lung Institute, London, UK.

Buller NP, Poole-Wilson PA, Mechanism of the increased ventilatory response to exercise in patients with chronic heart failure, Heart 1990; 63; p.281-283.
The National Heart and Lung Institute and National Heart Hospital, London, UK.

Elborn JS, Riley M, Stanford CF, Nicholls DP, The effects of flosequinan on submaximal exercise in patients with chronic cardiac failure, Br J Clin Pharmacol. 1990 May; 29(5): p.519-524.
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1.2 Asthma

Let us look at MV (minute ventilation) in patients with asthma at rest. Here again, the breathing rates relate to the state of patients when they do not have any acute episodes or symptoms of their disease, since during exacerberations, chronically sick people breathe even more.

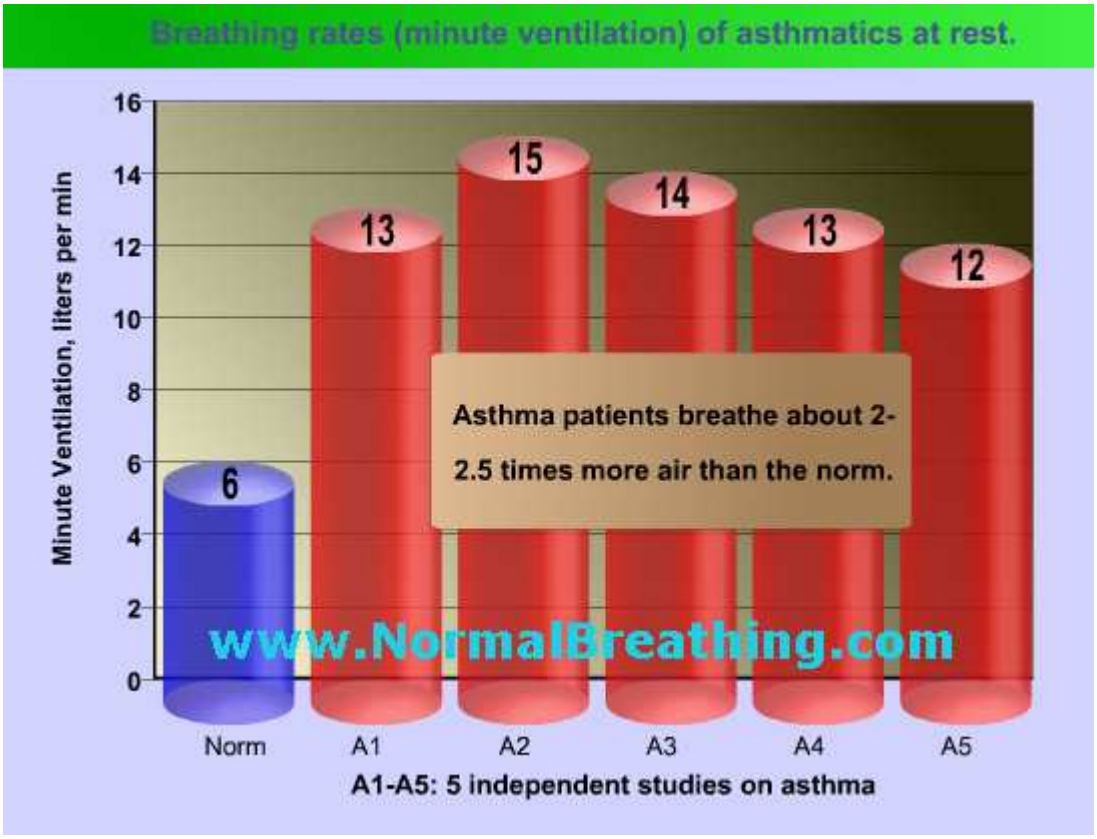

Table 1b. Western scientific evidence about the prevalence of CHV (chronic hyperventilation) in patients with asthma.

*One row corresponds to one medical study/publication

Condition	Minute ventilation	Number of patients	Prevalence of CHV	References
Normal breathing	**6 L/min**	-	0 %	Medical textbooks
Asthma	**13 (±2) L/min**	16	100%	Chalupa et al, 2004
Asthma	**15 L/min**	8	100%	Johnson et al, 1995
Asthma	**14 (±6) L/min**	39	100%	Bowler et al, 1998
Asthma	**13 (±4) L/min**	17	100%	Kassabian et al, 1982
Asthma	**12 L/min**	101	100%	McFadden & Lyons, 1968

References (in the same order)

Chalupa DC, Morrow PE, Oberdörster G, Utell MJ, Frampton MW, Ultrafine particle deposition in subjects with asthma, Environmental Health Perspectives 2004 Jun; 112(8): p.879-882.
Department of Medicine, University of Rochester School of Medicine and Dentistry, 601 Elmwood Avenue, Rochester, NY 14642, USA.

Johnson BD, Scanlon PD, Beck KC, Regulation of ventilatory capacity during exercise in asthmatics, J Appl Physiol. 1995 Sep; 79(3): 892-901.
Department of Internal Medicine, Mayo Clinic and Foundation, Rochester, Minnesota 55905, USA

Bowler SD, Green A, Mitchell CA, Buteyko breathing techniques in asthma: a blinded randomised controlled trial, Med J of Australia 1998; 169: 575-578.
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Kassabian J, Miller KD, Lavietes MH, Respiratory center output and ventilatory timing in patients with acute airway (asthma) and alveolar (pneumonia) disease, Chest 1982 May; 81(5): p.536-543.
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1.3 Diabetes

We have the same general picture for diabetes.

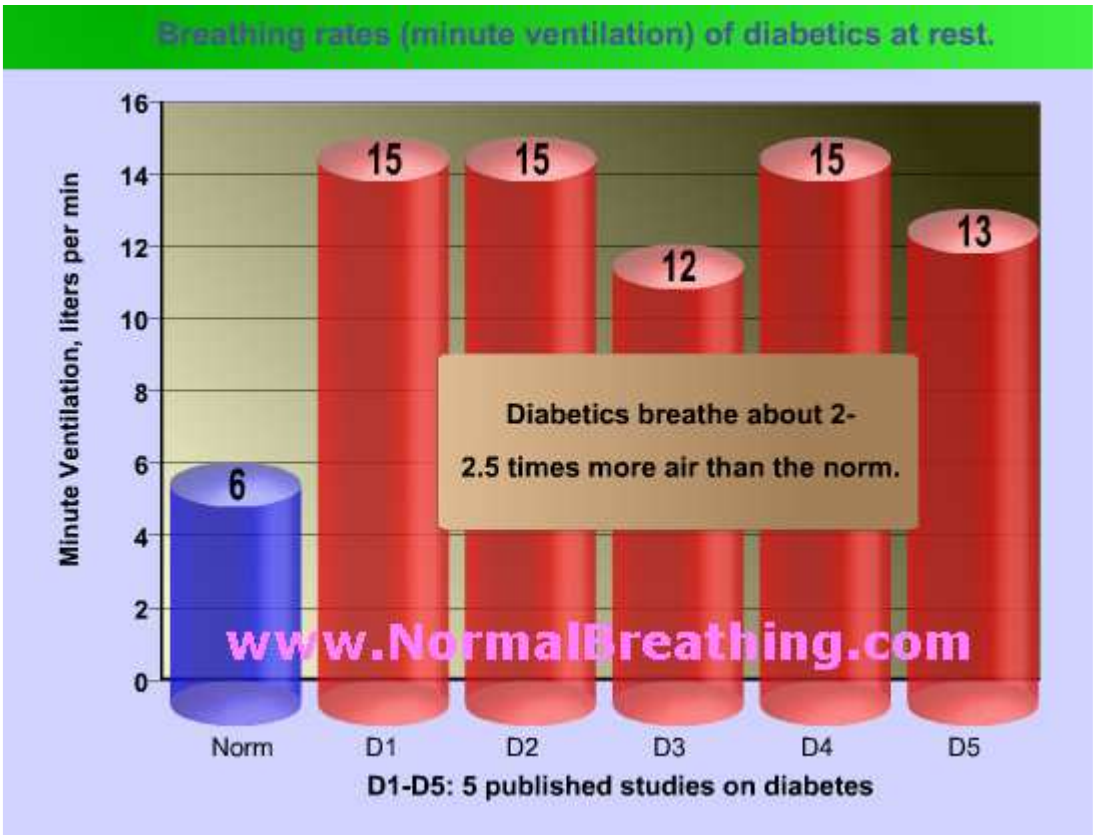

Table 1c. Western scientific evidence about the prevalence of CHV (chronic hyperventilation) in patients with diabetes.

*One row corresponds to one medical study/publication

Condition	Minute ventilation	Number of patients	Prevalence of CHV	References
Normal breathing	**6 L/min**	-	0 %	Medical textbooks
Diabetes	**12-17 L/min**	26	100%	Bottini et al, 2003
Diabetes	**15 (±2) L/min**	45	100%	Tantucci et al, 2001
Diabetes	**12 (±2) L/min**	8	100%	Mancini et al, 1999
Diabetes	**10-20 L/min**	28	100%	Tantucci et al, 1997
Diabetes	**13 (±2) L/min**	20	100%	Tantucci et al, 1996

References (in the same order)

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Dept of Internal Medicine and Endocrine-Metabolic Sciences, University of Perugia, Perugia, Italy

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Clinica di Semeiotica Metodologia Medica, University of Ancona, Ospedale Regionale Torrette, Ancona 60020; and Istituto di Medicina Interna e Scienze Endocrine e Metaboliche, University of Perugia, Perugia 06100, Italy

1.4 Other chronic diseases and disorders

The following studies also show heavy breathing in sick people with cancer, COPD, liver cirrhosis, cystic fibrosis, epilepsy, panic disorder, bipolar disorder, etc.

Table 1d. Western scientific evidence about the prevalence of CHV (chronic hyperventilation) in patients with other chronic conditions.

*One row corresponds to one medical study/publication

Condition	Minute ventilation	Number of patients	Prevalence of CHV	References
Normal breathing	**6 L/min**	-	0 %	Medical textbooks
Pulm hypertension	**12 (±2) L/min**	11	100%	D'Alonzo et al, 1987
Cancer	**12 (±2) L/min**	40	100%	Travers et al, 2008
COPD	**14 (±2) L/min**	12	100%	Palange et al, 2001
COPD	**12 (±2) L/min**	10	100%	Sinderby et al, 2001
COPD	**14 L/min**	3	100%	Stulbarg et al, 2001
Sleep apnoea	**15 (±3) L/min**	20	100%	Radwan et al, 2001
Liver cirrhosis	**11-18 L/min**	24	100%	Epstein et al, 1998
Hyperthyroidism	**15 (±1) L/min**	42	100%	Kahaly, 1998
Cystic fibrosis*	**13 (±2) L/min**	10	100%	Bell et al, 1996
Cystic fibrosis	**11-14 L/min**	6	100%	Tepper et al, 1983
Epilepsy	**13 L/min**	12	100%	Esquivel et al, 1991
CHV	**13 (±2) L/min**	134	100%	Han et al, 1997
Panic disorder	**12 (±5) L/min**	12	100%	Pain et al, 1991
Bipolar disorder	**11 (±2) L/min**	16	100%	MacKinnon et al, 2007
Dystrophia myotonica	**16 (±4) L/min**	12	100%	Clague et al, 1994

There are many more published studies obtaining the same results: **Sick people breathe too much.** In fact**,** all of the studies which I have found demonstrated the same conclusion (100% prevalence of overbreathing in the sick). Why is the minute ventilation test frequently done on heart patients rather than, for example, people with cancer? Heart patients often perform a “stress test” and minute ventilation is a normal parameter to be found and recorded during this test. Similarly, asthma and COPD patients routinely perform respiratory tests which are later published in medical journals. Hopefully, more awareness about the importance of normal breathing will result in more respiratory tests in relation to patients with cancer, GI problems, obesity, immune disorders and other chronic conditions.

References (in the same order)

D'Alonzo GE, Gianotti LA, Pohil RL, Reagle RR, DuRee SL, Fuentes F, Dantzker DR, Comparison of progressive exercise performance of normal subjects and patients with primary pulmonary hypertension, Chest 1987 Jul; 92(1): p.57-62.

Travers J, Dudgeon DJ, Amjadi K, McBride I, Dillon K, Laveneziana P, Ofir D, Webb KA, O'Donnell DE, Mechanisms of exertional dyspnea in patients with cancer, J Appl Physiol 2008 Jan; 104(1): p.57-66.

Palange P, Valli G, Onorati P, Antonucci R, Paoletti P, Rosato A, Manfredi F, Serra P, Effect of heliox on lung dynamic hyperinflation, dyspnea, and exercise endurance capacity in COPD patients, J Appl Physiol. 2004 Nov; 97(5): p.1637-1642.

Sinderby C, Spahija J, Beck J, Kaminski D, Yan S, Comtois N, Sliwinski P, Diaphragm activation during exercise in chronic obstructive pulmonary disease, Am J Respir Crit Care Med 2001 Jun; 163(7): 1637-1641.

Stulbarg MS, Winn WR, Kellett LE, Bilateral Carotid Body Resection for the Relief of Dyspnea in Severe Chronic Obstructive Pulmonary Disease, Chest 1989; 95 (5): p.1123-1128.

Radwan L, Maszczyk Z, Koziorowski A, Koziej M, Cieslicki J, Sliwinski P, Zielinski J, Control of breathing in obstructive sleep apnoea and in patients with the overlap syndrome, Eur Respir J. 1995 Apr; 8(4): p.542-545.

Epstein SK, Zilberberg MD; Facoby C, Ciubotaru RL, Kaplan LM, Response to symptom-limited exercise in patients with the hepatopulmonary syndrome, Chest 1998; 114; p. 736-741.

Kahaly GJ, Nieswandt J, Wagner S, Schlegel J, Mohr-Kahaly S, Hommel G, Ineffective cardiorespiratory function in hyperthyroidism, J Clin Endocrinol Metab 1998 Nov; 83(11): p. 4075-4078.

Bell SC, Saunders MJ, Elborn JS, Shale DJ, Resting energy expenditure and oxygen cost of breathing in patients with cystic fibrosis, Thorax 1996 Feb; 51(2): 126-131.

Tepper RS, Skatrud B, Dempsey JA, Ventilation and oxygenation changes during sleep in cystic fibrosis, Chest 1983; 84; p. 388-393.

Esquivel E, Chaussain M, Plouin P, Ponsot G, Arthuis M, Physical exercise and voluntary hyperventilation in childhood absence epilepsy, Electroencephalogr Clin Neurophysiol 1991 Aug; 79(2): p. 127-132.

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Pain MC, Biddle N, Tiller JW, Panic disorder, the ventilatory response to carbon dioxide and respiratory variables, Psychosom Med 1988 Sep-Oct; 50(5): p. 541-548.

MacKinnon DF, Craighead B, Hoehn-Saric R, Carbon dioxide provocation of anxiety and respiratory response in bipolar disorder, J Affect Disord 2007 Apr; 99(1-3): p.45-49.

Clague JE, Carter J, Coakley J, Edwards RH, Calverley PM, Respiratory effort perception at rest and during carbon dioxide rebreathing in patients with dystrophia myotonica, Thorax 1994 Mar; 49(3): p.240-244.

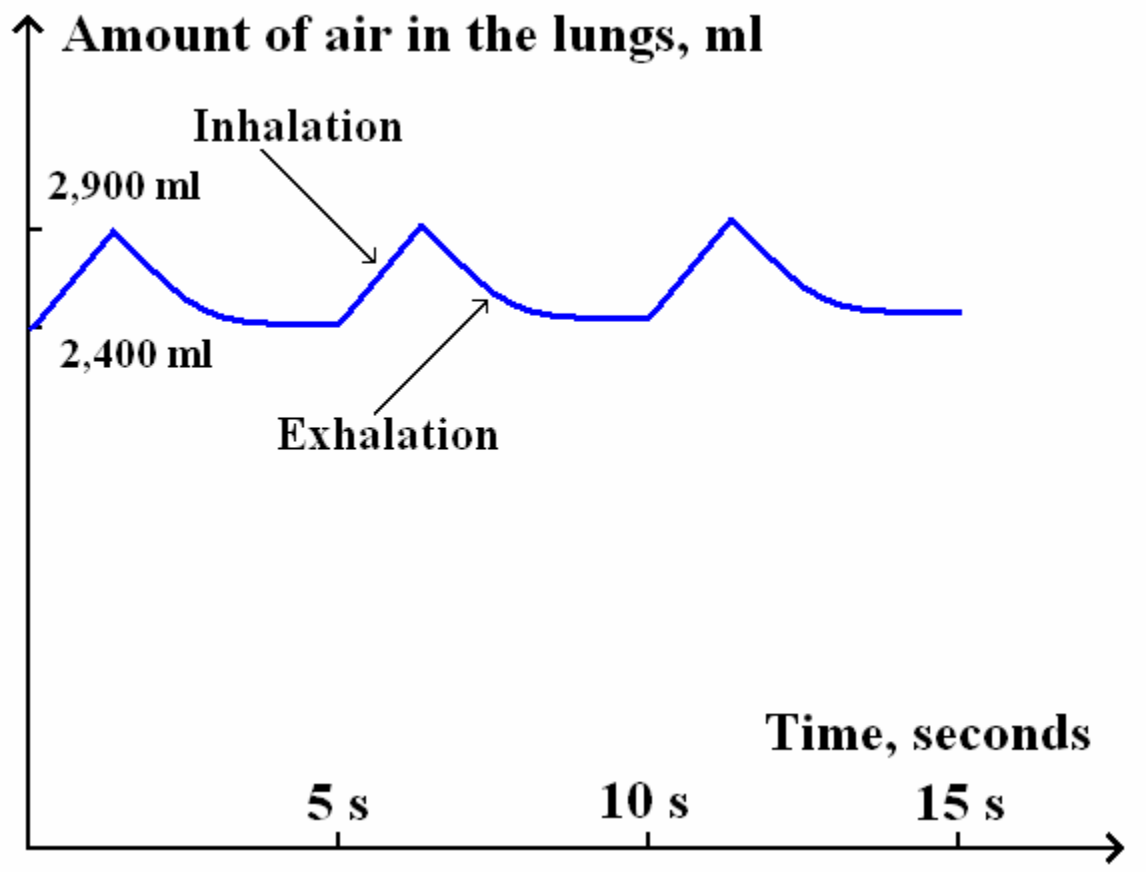
2. Parameters of normal breathing

2.1 Physiological norms

Normal breathing is strictly nasal (in and out), mainly diaphragmatic (i.e., abdominal), slow (in frequency) and imperceptible (no feelings or sensation about one's own breathing at rest; see the explanation below).

The physiological norm for minute ventilation at rest is 6 litres of air per minute for a 70 kg man (see references for textbooks below: Guyton, 1984; Ganong, 1995; Straub, 1998; Castro, 2000; etc.). These medical textbooks also provide the following parameters of normal breathing:
- normal tidal volume (air volume breathed in during a single breath): 500 ml;
- normal breathing frequency: 12 breaths per minute;
- normal inspiration: about 2 seconds;
- normal exhalation is 2-3 seconds.

The following graph represents the normal breathing pattern at rest or the dynamic of the volume of the lungs as a function of time:



If a person with normal breathing is asked about their breathing sensations, they will testify that they do not feel their breathing. Why is this so? Normal tidal volume is only 500 ml or about 0.6 g of air, which is inhaled during one inspiration. Hence, normal breathing is slow in frequency and very small in amplitude. Sick people breathe deeper and faster. They often feel movements of air in the nose, chest movements, and other effects related to their deep and noisy breathing. Their deep breathing reduces body oxygenation and creates tissue hypoxia due to hypocapnic (low in CO2) constriction of blood vessels and the suppressed Bohr effect discussed later.

2.2 Other parameters of normal breathing

“If a person breath-holds after a normal exhalation, it takes about 40 seconds before breathing commences” (McArdle et al, 2000). This indicates normal oxygenation of tissues.

The current medical norm for CO2 content in the alveoli of the lungs and the arterial blood is 40 mm Hg CO2. This number was established about a century ago by the famous British physiologists Charles G. Douglas and John S. Haldane from Oxford University. Their results were published in 1909 in the article "The regulation of normal breathing" by the Journal of Physiology (Douglas & Haldane, 1909).
Normal breathing is regular, invisible (no chest or belly movements), and inaudible (no panting, no wheezing, no sighing, no yawning, no sneezing, no coughing, no deep inhalations or exhalations).

In order to define one’s breathing pattern, measure your body oxygenation or breath holding time after your usual exhalation, but only until the first sign of stress or discomfort.

The person with normal breathing is going to have about a 40 second breath holding time (or body oxygenation index). In the case of chronic over-breathing, breath holding time becomes shorter indicating reduced body oxygen stores. We are going to consider medical studies devoted to this breath holding time test later.

References: Medical and physiological textbooks

Ganong WF, Review of medical physiology, 15-th ed., 1995, Prentice Hall Int., London.

Guyton AC, Physiology of the human body, 6-th ed., 1984, Suanders College Publ., Philadelphia.

McArdle W.D., Katch F.I., Katch V.L., Essentials of exercise physiology (2-nd edition); Lippincott, Williams and Wilkins, London 2000.

Straub NC, Section V, The Respiratory System, in Physiology, eds. RM Berne & MN Levy, 4-th edition, Mosby, St. Louis, 1998.

Summary of values useful in pulmonary physiology: man. Section: Respiration and Circulation, ed. by P.L. Altman & D.S. Dittmer, 1971, Bethesda, Maryland (Federation of American Societies for Experimental Biology).

2.3 Myths about breathing and body oxygenation (prevalence: over 90%)

Myth #1. My breathing is OK and I know how to breathe.
Less than 10% of people have normal breathing parameters and body oxygen stores these days. We are going to consider 24 medical and physiological respiratory studies done on ordinary subjects during last 80 years. It is a fact that the medical norm established about a century ago is not a norm anymore. Modern people breathe about 2 times more air than we did 100 years ago. Hyperventilation results in tissue hypoxia and many other biochemical abnormalities (read Myth #3 below). Your breathing is normal, if and only if you have normal body oxygenation. How can you check it? You should be able to easily hold your breath for at least 40 seconds after your usual exhalation and with no stress at the end of the test. This test is described in detail later.

Myth #2. More breathing (deeper and/or greater volume) means better body oxygenation.
There is zero scientific evidence about this deep breathing myth, but hundreds of published studies have clearly shown that hyperventilation (or breathing more than the tiny medical norm) reduces oxygen supply to the brain, heart, liver, kidneys, and all other vital organs. Nevertheless, on TV, radio, and in everyday life situations, people who have little knowledge of physiology say, "Take a deep breath, get more oxygen", or "Breathe deeper for better oxygenation", etc.

Myth #3. Breathing is regulated by want for oxygen.
If you open any medical or physiological textbook with the description of the control of respiration, you will find that in normal conditions, breathing is regulated by the CO2 concentration in the arterial blood and the brain. Whatever we do (sit, walk, eat, run, sleep, etc.), CO2 concentration is kept within a narrow range (0.1% accuracy) by the breathing centre located in the medulla oblongata of the brain.

Myth #4. CO2 is a poisonous or toxic gas and a waste product to get rid off.
When a healthy person tries to hyperventilate or is forced to breathe deeply and fast, he experiences "hypocapnia" (CO2 deficiency) in the blood and other fluids, tissues, and cells. The immediate effects are: constriction of blood vessels (CO2 is a powerful vasodilator) and reduced blood and oxygen supply to the brain, heart and all other vital organs. This is the reason why it is so easy to faint or pass out after 2-3 minutes of forceful hyperventilation. Horses and dogs died in 15-20 minutes, when they were forced to hyperventilate by a suction and exhaust pump. Another CO2 effect is the suppressed Bohr law or diminished release of oxygen by the blood in the tissues due to the same hypocapnia. Apart from these phenomena, there are many other vital functions of CO2 in the human body. Meanwhile, reduced tissue oxygenation is sufficient to promote cancer, heart disease, diabetes and many other chronic conditions in case of overbreathing.

Myth #5. When a person is healthy, they can feel how they breathe.
If people with normal breathing are asked what they feel about their breathing, they will say that they feel nothing at all (as if they are barely breathing). "The perfect man breathes as if he is not breathing" Lao-Tzu, circa 4th century BC. Indeed, if you have any healthy people around you and observe their breathing for 20-30 seconds, you will see and hear nothing. The medical norm for breathing (6 L/min) is tiny.

Myth #6. Sick people notice when their breathing becomes abnormal.
100% prevalence of hyperventilation at rest for the sick people at rest is confirmed by over 20 published western studies on heart disease, cancer, asthma, COPD, diabetes, cystic fibrosis, epilepsy, panic attacks, chronic fatigue, and many other conditions. These sick patients breathe about 2-3 times more than the norm, and usually do not complain or even notice that their breathing is heavy or too deep. Why? Because air is weightless and the main breathing muscles (diaphragm and chest) are very powerful: we can pump 25 times more air during maximum exercise (or about 150 litres of air in one minute), than we require for normal breathing at rest (only about 6 L/min). People may notice that their breathing is heavy during heart attacks, stroke, asthma attacks, or morning hyperventilation (between 4 and 7 am), when chronically sick people are most likely to die from acute episodes triggered by hyperventilation.

One may easily confirm that most their relatives, friends, and other people do believe in these myths. My observations (about 90% prevalence of these myths among the general population) are based on conversations with thousands of people.

2.4 Do modern healthy people also overbreathe?

We see that, according to 14 recent medical studies, healthy people still breathe little.

Table 2. Minute ventilation (or minute breathing rates) at rest in healthy subjects (14 studies)

Condition	**Minute ventilation**	N. of subjects	Reference
Normal breathing	**6 L/min**	-	Medical textbooks
Healthy subjects	**7.7 ± 0.3 L/min**	19	Douglas et al, 1982
Healthy males	**8.4 ± 1.3 L/min**	10	Burki, 1984
Healthy males	**6.3 L/min**	10	Smits et al, 1987
Healthy males	**6.1±1.4 L/min**	6	Fuller et al, 1987
Healthy subjects	**6.1± 0.9 L/min**	9	Tanaka et al, 1988
Healthy students	**7.0 ± 1.0 L/min**	10	Turley et al, 1993
Healthy subjects	**6.6 ± 0.6 L/min**	10	Bengtsson et al, 1994
Healthy subjects	**7.0±1.2 L/min**	12	Sherman et al, 1996
Healthy subjects	**7.0±1.2 L/min**	10	Bell et al, 1996
Healthy subjects	**6 ± 1 L/min**	7	Parreira et al, 1997
Healthy subjects	**7.0 ± 1.1 L/min**	14	Mancini et al, 1999
Healthy subjects	**6.6 ± 1.1 L/min**	40	Pinna et al, 2006
Healthy subjects	**6.7 ± 0.5 L/min**	17	Pathak et al, 2006
Healthy subjects	**6.7 ± 0.3 L/min**	14	Gujic et al, 2007

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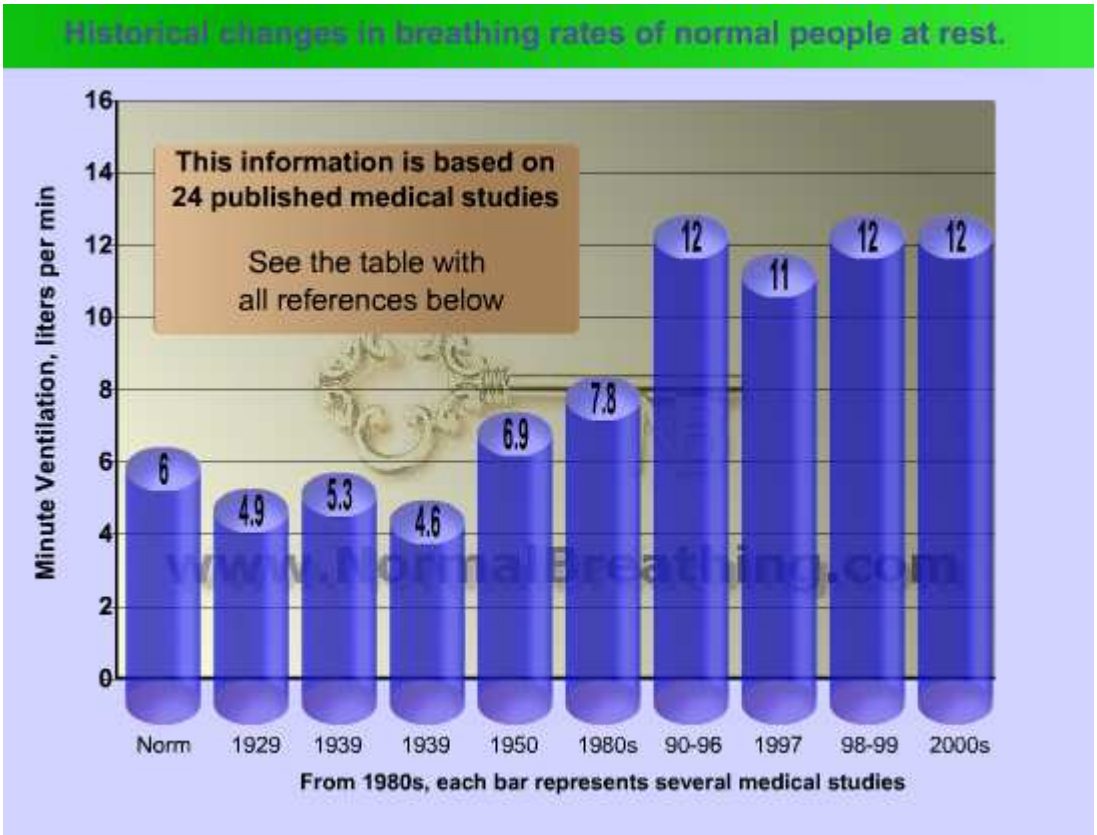
2.5 What about historical changes in the breathing of ordinary people?



The table below represents results of 24 medical studies (from 1929 until 2007). It tells us that before WW2 breathing rates of ordinary people were even less than normal. During last 2 decades ordinary people breathe about 2 times more air than the medical norm.

Table 3. Historical changes in minute ventilation (or minute breathing rates) at rest for normal subjects

Condition	Minute ventilation	Age	N. of subjects	Reference
Normal breathing	**6 L/min**	16	-	Medical textbooks
Normal subjects	**4.9**	-	5	Griffith et al, 1929
Normal males	**5.3±0.1**	27-43	46	Shock et al, 1939
Normal females	**4.6±0.1**	27-43	40	Shock et al, 1939
Normal subjects	**6.9±0.9**	-	100	Matheson et al, 1950
Normal subjects	**9.1±4.5**	31±7	11	Kassabian et al, 1982
Normal subjects	**8.1±2.1**	42±14	11	D'Alonzo et al, 1987
Normal subjects	**6.3±2.2**	-	12	Pain et al, 1988
Normal males	**13±3**	40 (av.)	12	Clague et al, 1994
Normal subjects	**9.2±2.5**	34±7	13	Radwan et al, 1995
Normal subjects	**15±4**	28-34	12	Dahan et al, 1995
Normal subjects	**12±4**	55±10	43	Clark et al, 1995
Normal subjects	**12±2**	41±2	10	Tantucci et al, 1996
Normal subjects*	**11±3**	53±11	24	Clark et al, 1997
Normal subjects	**8.1±0.4**	34±2	63	Meessen et a,. 1997
Normal females	**9.9**	20-28	23	Han et al, 1997

Normal males	**15**	20-28	47	Han et al, 1997
Normal females	**10**	29-60	42	Han et al, 1997
Normal males	**11**	29-62	42	Han et al, 1997
Normal subjects	**13±3**	36±6	10	Tantucci et al, 1997
Normal subjects	**12±1**	65±2	10	Epstein et al, 1996
Normal subjects	**12±1**	12-69	20	Bowler et al, 1998
Normal subjects	**10±6**	39±4	20	DeLorey et al, 1999
Normal seniors	**12±4**	70±3	14	DeLorey et al, 1999
Normal elderly*	**14±3**	88±2	11	DeLorey et al, 1999
Normal subjects	**17±1**	41±2	15	Tantucci et al, 2001
Normal subjects	**10±0.5**	-	10	Bell et al, 2005
Normal subjects	**8.5±1.2**	30±8	69	Narkiewicz, 2006
Normal females	**10±0.4**	-	11	Ahuja et al, 2007
Normal subjects	**12±2**	62±2	20	Travers et al, 2008

* When the average weight of the subjects was significantly different from 70 kg, minute ventilation was adjusted to the normal weight (70 kg) value.

Note that the results are inconsistent since there is no strict definition for “normal” or “control” subjects in medical research. Consider a medical study with a group of asthmatics. If the organizers of the study want to see the effects of some medication or treatment on these asthmatics, the researchers may also select a group of control subjects for comparison. These “control” subjects must be either asthma-free or they must be free from any serious health problems and symptoms.

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3. Effects of overbreathing (hyperventilation)

3.1 Hypocapnia (or CO2 deficiency in the blood and cells)

When a person starts to over-breathe or hyperventilate (breathe more air per minute), blood oxygenation in the lungs has a negligible increase. Why? During normal breathing haemoglobin cells of the arterial blood have 98-99% O2 saturation. Hence, more breathing cannot increase blood oxygenation to any significant degree.

If a healthy person starts to breathe more or deeper, what are the other effects,?
- More carbon dioxide is removed from the lungs with each breath and therefore the level of CO2 in the lungs immediately decreases.
- In 1-2 minutes, the CO2 level falls below the normal levels in all the blood due to its circulation.
- In 3-5 minutes, due to CO2 diffusion, most cells of the body (including vital organs and muscles) experience lowered CO2 concentrations;
- In 15-20 minutes, the CO2 level in the brain is below the norm due to a slower diffusion rate.

3.2 Vasoconstriction

As independent physiological studies found, hypocapnia (low CO2 concentration in the arterial blood) decreased perfusion of the following organs:
- brain (Fortune et al, 1995; Karlsson et al, 1994; Liem et al, 1995; Macey et al, 2007; Santiago & Edelman, 1986; Starling & Evans, 1968; Tsuda et al, 1987),
- heart (Coetzee et al, 1984; Foëx et al, 1979; Karlsson et al, 1994; Okazaki et al, 1991; Okazaki et al, 1992; Wexels et al, 1985),
- liver (Dutton et al, 1976; Fujita et al, 1989; Hughes et al, 1979; Okazaki, 1989),
- kidneys (Karlsson et al, 1994; Okazaki, 1989),
- spleen (Karlsson et al, 1994),
- colon (Gilmour et al, 1980).

Some abstracts of these studies are provided at the bottom of this page.

What is the physiological mechanism of the reduced blood flow to vital organs? CO2 is a dilator of blood vessels (arteries and arterioles). Arteries and arterioles have their own tiny smooth muscles that can constrict or dilate depending on CO2 concentrations. When we breathe more, CO2 level in the arterial blood decreases, blood vessels constrict and vital organs (like the brain, heart, kidneys, liver, stomach, spleen, colon, etc.) get less blood supply.

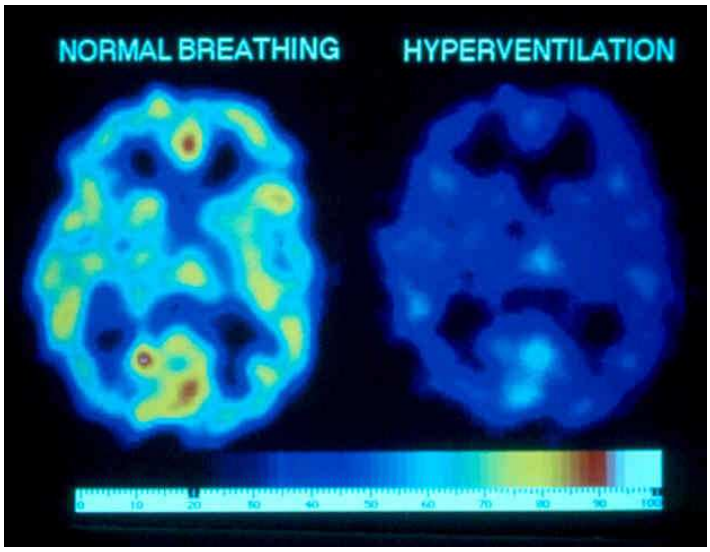
Are there any related systemic effects? The state of these blood vessels (arteries and arterioles) defines the total resistance to the systemic blood flow in the human body. Hence, hypocapnia increases the strain on the heart. Hence, breathing directly participates in regulation of the heart rate. The father of cardiorespiratory physiology, Yale University Professor Yandell Henderson (1873-1944), investigated this effect about a century ago.

Among his numerous physiological studies, he performed experiments with anaesthetized dogs on mechanical ventilation. The results were described in his publication "Acapnia and shock. - I. Carbon dioxide as a factor in the regulation of the heart rate". In this article, published in 1908 in the American Journal of Physiology, he wrote, "... we were enabled to regulate the heart to any desired rate from 40 or fewer up to 200 or more beats per minute. The method was very simple. It depended on the manipulation of

the hand bellows with which artificial respiration was administered... As the pulmonary ventilation increased or diminished the heart rate was correspondingly accelerated or retarded" (p.127, Henderson, 1908).

Other medical observations

Imagine that a person at rest starts to hyperventilate or breathe very heavy and fast. What would happen? The person would feel dizzy and could faint or pass out. Why? It cannot be due to too much oxygen, since their blood is almost fully saturated with O2 with very shallow (or normal) breathing at rest. This scan shows brain oxygenation in two conditions: normal breathing and after 1 minute of hyperventilation. The red color represents the most O2, dark blue the least. Brain oxygenation for overbreathing is reduced by 40%. (Litchfield, 2003).



This result is quoted in many medical textbooks (e.g., Starling & Evans, 1968) since the effect is well documented and has been confirmed by dozens of professional experiments. According to the Handbook of Physiology (Santiago & Edelman, 1986), cerebral blood flow decreases 2% for every mm Hg decrease in CO2 pressure. Why?

Be observant. When you get a small bleeding cut or a wound, deliberately hyperventilate and see if that can help stop the bleeding. It should happen. As an alternative, perform comfortable breath holding and breathe less and accumulate CO2. What would happen with your bleeding? (It should increase.) Now you know what to do after dental surgeries, brain traumas, and other accidents involving bleeding. It is natural for humans and other animals to breathe heavily in such conditions. Hence, hyperventilation can be life saving in cases of severe bleeding.

Why did Nature provide us with this physiological reaction: vasoconstriction due to hyperventilation? Breathing is closely connected with blood flow to all vital organs, sensitivity of the immune system, permeability of cellular membranes, and many other functions. As soon as vital organs (the brain, heart, stomach, kidneys, liver, etc.) are under stress (chemical, viral, bacteriological, etc.), or inflammation, or injury, the breathing gets heavier.

That helps to prevent:
- excessive bleeding (as in cases of open injuries, cuts, bruises, etc.);
- quick spread of bacterial and viral infections;
- excessive amounts of toxic products in the blood from injured, infected, or polluted tissues;
- damage to vital cleansing organs (e.g., liver and kidneys) due to their possible toxic overload.

All these preventive effects can save the life of the organism in the short run. At the same time, it is not normal to be in a state of stress (chronic hyperventilation) all the time. Our breathing, if there is no emergency, should be normal.

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3.3 Suppressed Bohr effect

Why do hemoglobin cells of the arterial blood release oxygen in the tissues, not in the arteries, or arterioles, or veins? Why is more oxygen released in those tissues of the human body that produce more energy? These processes depend on local CO2 content due to the Bohr law (or Bohr effect). The effect was first described in 1904 by the Danish physiologist Christian Bohr (father of famous physicist Niels Bohr). He stated that at higher CO2 content in tissues (more acidic environment), hemoglobin will bind to oxygen with less affinity. Hence, those tissues that generate more CO2 will get more oxygen from the blood.

There are many modern professional investigations devoted to various aspects of this effect (e.g., Braumann et al, 1982; Böning et al, 1975; Bucci et al, 1985; Carter et al, 1985; diBella et al, 1986; Dzhagarov et al, 1996; Grant et al, 1982; Grubb et al, 1979; Gersonde et al, 1986; Hlastala & Woodson, 1983; Jensen, 2004; Kister et al, 1988; Kobayashi et al, 1989; Lapennas, 1983; Matthew et al, 1979; Meyer et al, 1978; Tyuma, 1984; Winslow et al, 1985).

Hyperventilation or reduced CO2 tissue tension leads to hampered oxygen release and reduced oxygen tension in tissues (Aarnoudse et al, 1981; Monday & Tétreault, 1980; Gottstein et al, 1976). In order to improve the release of oxygen by red blood cells, we require more CO2 in the cells and the whole body. Hence, we should learn how to breathe less for better body oxygenation.

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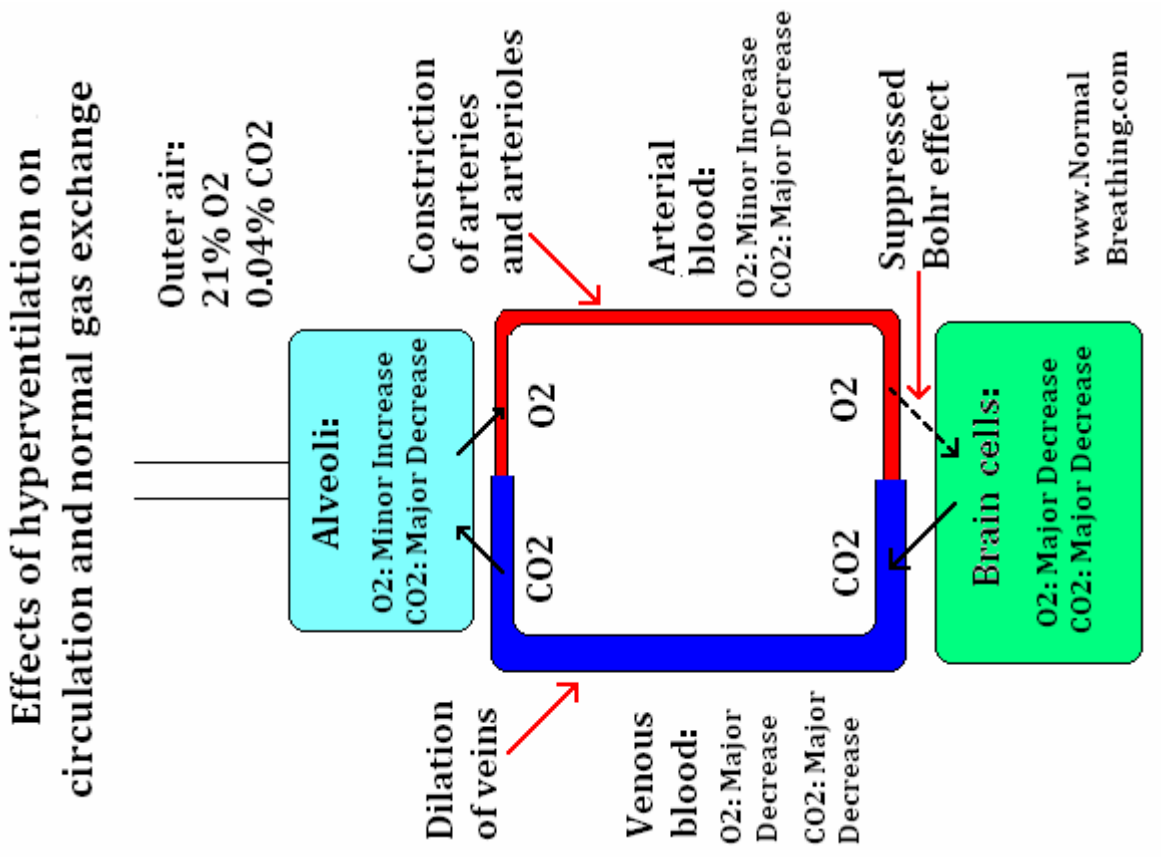
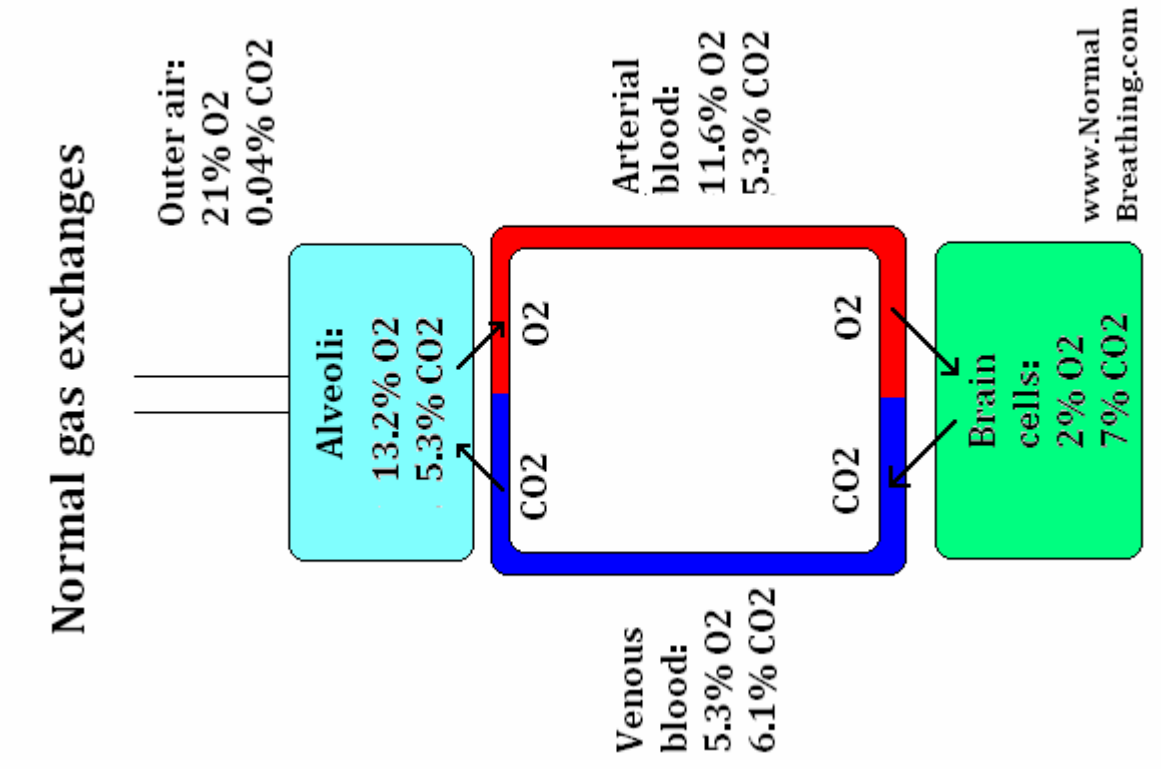
3.4 Less oxygen for cells

Summarizing these physiological facts, we conclude:
1. Hyperventilation cannot increase O2 content in the arterial blood to any significant degree (normal hemoglobin saturation is about 98%), but it reduces CO2 concentrations in all cells and the blood.
2. Hypocapnia (or CO2 deficiency) leads to constriction of blood vessels and that reduces blood supply to vital organs of the human body.
3. Hypocapnia (or CO2 deficiency) also leads to suppressed Bohr effect that causes further reduction in cellular oxygen delivery.

Hence, the more one breathes, the less oxygen is provided for vital organs.

The discussed effects of CO2-deficiency (hyperventilation) on blood circulation and oxygen transport are summarized on the graphs on the next page.





3.5 Other hypocapnia-related abnormalities

Among other effects of CO2 deficiency are:
- abnormal excitability and irritability of nerve cells (e.g., Brown, 1953; Krnjevic, 1965; Balestrino & Somjen, 1988; Huttunen et al, 1999);
- irritable state of muscles (muscular tension) (Brown, 1953; Hudlicka, 1973);
- bronchoconstriction (or reduced diameter of airways causing wheezing and sensations of breathlessness and suffocation) (Sterling, 1968);
- abnormalities with ions in blood plasma and other bodily fluids (Carryer, 1947);
- innumerable abnormalities in chemical reactions involving synthesis of amino acids, lipids (fats), carbohydrates, hormones, messengers, cells of the immune system, etc.

Dr. Brown in his article “Physiological effects of hyperventilation” analyzed almost 300 professional studies and stated, “Studies designed to determine the effects produced by hyperventilation on nerve and muscle have been consistent in their finding on increased irritability” (Brown, 1953).

Other authors (Balestrino & Somjen, 1988; Huttunen et al, 1999) also concluded that increased CO2 pressure generally reduces cortical excitability, while hyperventilation "leads to spontaneous and asynchronous firing of cortical neurons" (Huttunen et. al., 1999).

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4. How to measure breathing and oxygenation

4.1 How to measure the CP (the index of oxygenation)

Measurement of the CP (control pause)

Sit down and rest for 5-7 minutes. Completely relax all your muscles, including the breathing muscles. This relaxation produces natural spontaneous exhalation (breathing out). Pinch your nose at the end of this exhalation and count your CP (breath holding time) in seconds. Keep the nose pinched until you experience the first desire to breathe, so that, after you release the fingers, you can resume your usual breathing (in the same way as you were breathing just before you started to hold your breath). Do not extend breath holding too long. You should not gasp for air or open your mouth afterwards. The test should be easy and must not cause you stress because it does not interfere with your breathing.

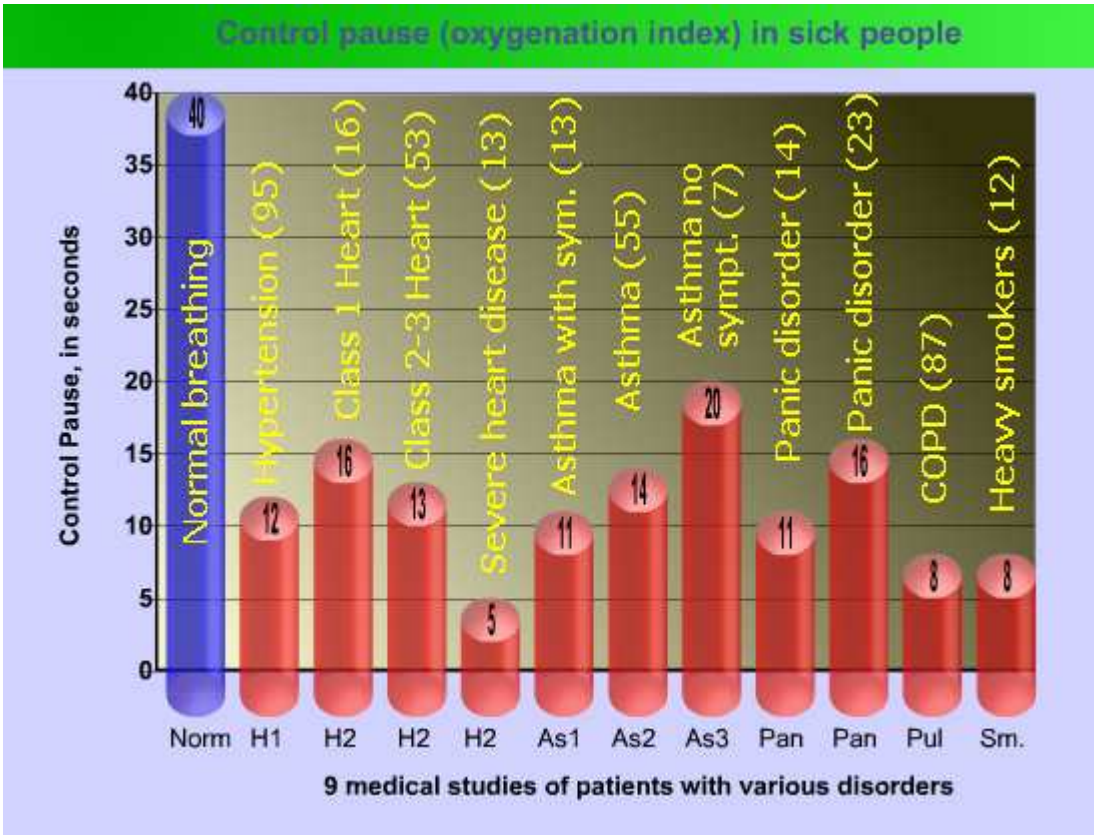
Look at the diagram below: after the test you can comfortably breathe as before the test.

If you hold the breath for too long time, the first inhale will be deep and noisy, as here:

Now one can easily define their own health state at any moment of time. Since breathing and body oxygenation vary throughout the day, one's health parameters are usually worse during early morning hours and the MCP (morning Control Pause), according to Dr. Buteyko and his colleagues, is the main parameter that reflects personal health state. The MCP test is done as the first thing in the morning, while lying in bed. It is important for future success, to write down your MCP every day. (The daily log is provided in Chapter 7 or can be downloaded from the website.)

The CP is the simplest and most accurate test of personal physical health for well over 97% of people. This physiological fact has been confirmed by many professional studies and experiences of thousands of formerly-sick people who recovered their health using breathing retraining.

Consider this graph with bars that summarize data from 9 independent medical publications. Each bar represents one physiological study with the title of the health condition studied and the number of patients (in brackets). The normal CP is about 40 seconds (the large blue bar). Shorter red bars corresponds to diseases states.



(Note. For example, the first red bar on the left represents a medical study in which it was found that 95 patients with hypertension had, on average, 12 seconds of oxygen in the body instead of normal 40 seconds.)

We can also easily observe here that the oxygenation index correlates well with severity of the severity of the disease for asthma and heart patients. For example, functional heart disease corresponds to about 5 seconds of oxygen in the body, moderate heart disease (class 2 US classification) to about 10 second CP, and light forms of heart disease to about 15 seconds. Similarly, asthmatics who experience symptoms have about 10 seconds of oxygen. In between attacks (or in stable conditions), asthmatics usually have about a 15 second CP. If they get up to a 20 second CP, they do not experience chest tightness, wheezing, blocked nose and other pathological effects.

In both cases, asthma and heart disease, patients generally do not require any medication and do not experience any negative symptoms, if their CP is above 20 seconds 24/7. The same observation has been found for bronchitis, sinusitis, chronic fatigue, eczema, epilepsy and many other disorders.

Hence, the first goal for most patients, in order to get more stable health and reasonable well-being is to have over 20 second CP 24/7.

The CP test not only defines oxygenation of the human body, it also tells us about your minute ventilation (or how much you breathe). If you have normal breathing, your CP should be about 40 seconds. If your CP is about 20 seconds, you breathe for 2 people. If your CP is 10 seconds, you breathe 4 times more than the norm. Hence, if you learn and practice some exercises that increase your body CO2 content and try to breathe less 24/7, your CP will grow and your health will improve.

References for the graph (in the same order)

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4.2 MCP (morning CP): your main health parameter

Physiological, medical and epidemiological studies have clearly shown that people with severe forms of heart disease, asthma, COPD, epilepsy, and many other conditions are most likely to die during early morning hours (4-7 am), when their breathing is the heaviest, body oxygenation is critically low, and the CP is the shortest (about 5 seconds or less). You can investigate relevant quotes and observations of western medical doctors on the webpage “Morning Hyperventilation” (www.normalbreathing.com/index-MorningHV.php) or by watching my Google video-clip “How we breathe in the morning”.

Most people also experience the shortest CPs during early morning hours and feel worst in the morning after waking up. Practical observations of Buteyko breathing teachers have confirmed that, indeed, in most people, up to 80% or more, their CPs significantly drops (up to 3-7 seconds or even more) during the night.

There are many causes that contribute to this Morning Hyperventilation effect. However, the very first aim for each person is to identify the presence and extent of this problem. How? Measure your CP immediately after waking up in the morning. As soon as you open your eyes, before getting out of the bed, do the stress-free breath holding time test. Have a ticking or other clock or watch nearby to help you define your breathing rate during last hours of sleep. The MCP (morning control pause) is the most important parameter of your physiological health.

4.3 Buteyko Table of Health Zones

Based on hundreds of medical studies, it is possible to suggest that the following effects take place with the progression of a chronic disease:
- we breathe more air (minute ventilation increases);
- breathing frequency becomes higher;
- breathing becomes deeper (tidal volume increases);
- CO2 content in blood decreases;
- CP becomes shorter;
- body oxygenation decreases;
- heart rate increases, etc.

These effects are reflected in the Buteyko Table of Health Zones.

Health state	Type of breathing	Degree	Pulse	Rf	% CO2	AP	CP	MP
Super-health	Shallow	5	48	3	7.5	16	180	210
		4	50	4	7.4	12	150	190
		3	52	5	7.3	9	120	170
		2	55	6	7.1	7	100	150
		1	57	7	6.8	5	80	120
Normal	Normal	-	60	8	6.5	4	60	90
Disease	Deep	-1	65	10	6.0	3	50	75
		-2	70	12	5.5	2	40	60
		-3	75	15	5.0	-	30	50
		-4	80	20	4.5	-	20	40
		-5	90	26	4.0	-	10	20
		-6	100	30	3.5	-	5	10

Table comments: Pulse – heart rate in 1 minute (all parameters are measured at rest); Rf – respiratory frequency in one minute (number of inhalations or exhalations in one minute); % CO2 - %CO2 in alveoli of the lungs (*or arterial blood if there is no mismatch); AP - the Automatic Pause or natural delay in breathing after exhalation (*during unconscious breathing); CP - the Control Pause, breath holding time after usual exhalation and until first distress; WP - Willful Pause, breath holding time from the first distress until the limit (after it, make frequent, but small inhalations while breathing through a slightly pinched nose); MP (the Maximum Pause, the sum of the CP and WP.

* Note about pulse: Not all people have greatly increased heart rates, as is provided by this table, when parameters are at the bottom of the table or their CPs are low. Some categories of people with less than 20 second CP can have a resting pulse of around 60 - 70. However, increased heart rate for lower CPs is a feature of, for example, heart patients and patients with severe asthma. During the 1960's, when conducting his research, and later, Buteyko and his colleagues applied the Buteyko breathing retraining program mainly for heart and asthma patients, who were mostly hospitalized with frequent deficiencies in blood cortisol levels.

/ This version is based on Buteyko KP, The method of volitional elimination of deep breathing [English translation of the Small Buteyko Manual], Voskresensk, 1994.

Dr. Buteyko developed this table during 1960s, after analyzing hundreds of sick and healthy people in his respiratory laboratory, and presented it during his Lecture for the leading scientists at the Moscow State

University in 1969. The Table reflects the health of his numerous hospitalized and severely sick patients, who started their journey for health at the very bottom of the table and climbed up, sometimes to the very top of the table.

The middle row of the table corresponds to normal health. Below this row are 7 zones corresponding to disease. The borders for these zones are given by 7 rows (from normal down to "minus 6-th" degree). Five zones of super-health are above the middle row. Let us start from the very bottom of this table and work up.

Terminally sick and critically ill patients during acute stages

The lowest row of this table corresponds to severely sick and terminally ill patients in critical conditions. When people are at the risk of dying, the table predicts over 100 beats per minute for their heart rate, over 30 breaths per minute for respiratory frequency, less than 3.5% CO2 in the alveoli of the lungs. The CP (Control Pause or stress-free breath holding time after usual exhalation) is less than 5 seconds.

Terminally sick and critically ill patients in more stable conditions

The next row from the bottom corresponds to severely sick and terminally ill patients in stable conditions. Typical heart rates of such people are above 90 beats per minute (sitting at rest). Respiratory rate (or breathing frequency) is above 26 breaths per minute at rest. A CO2 concentration in alveoli of the lungs is no more than 4%. There is no automatic pause (period of no breathing after exhalation). The Control Pause is less than 10 seconds, while the Maximum Pause is less than 20 seconds. (Numerous medical studies confirmed that over 90% of patients with chronic diseases indeed die in conditions of severe hyperventilation, while their heart rate and respiratory frequency become much higher than the norms. Quotes and exact numbers from such studies can be found on my website in relation to heart disease, asthma, cancer, and many other conditions.)

These patients usually require numerous types of medication to prevent their multiple symptoms and complaints. Due to heavy labored breathing, dyspnea, and low body oxygenation at rest, walking is hard and climbing stairs is often impossible. Most of the time is spent in bed, since even sitting requires effort. Sleep is dreadful since breathing and symptoms get much worse after transition into a horizontal position. Early morning hours (4-7 am) is the time when these patients are most likely to die from heart attack, stoke, asthma attack, or complications from cancer, diabetes, and many other pathologies.

Patients with moderate degree of their disease

The next row ("minus 4-th" degree of health) corresponds to patients whose life is not threatened at the moment, but their main concern are symptoms. People with mild asthma, heart disease, diabetes, initial stages of cancer, and many other chronic disorders are all in this zone. Taking medication is the normal feature for most of these people.

As we see from the table, heart rate for these patients varies from 80 to 90 beats per minute. Breathing frequency is between 20 and 26 breaths per minute (the medical norm is 12, while doctor Buteyko's norm is 8 breaths per minute at rest). CO2 concentration in alveoli of the lungs is between 4.0 and 4.5%. The CP is between 10 and 20 seconds.

Physical exercise is very hard, since even fast walking results in very heavy breathing through the mouth, exhaustion, and worsening of symptoms. Complains about fatigue are normal. All these symptoms are often so debilitating that they interfere with normal life and the ability to work, analyze information, care about others, etc. Living in the chronic state of stress and being preoccupied with one's own miserable health are normal, while efficiency and performance in various areas (science, arts, sports, etc.) are compromised. Sitting in armchairs or soft couches is the most favorite posture.

Parameters of these people get worse during early morning hours with corresponding worsening of symptoms. Many sufferers get less than 10 seconds for the morning CP with all effects accompanying the last stage of the disease.

Most modern people

Most modern healthy people have between 20 and 30 second CP. Hence, they are going to be in the third row from the bottom ("minus 3-rd" degree of health). While there is no need for taking medication in this zone, numerous health pathologies are frequent. This relates to gastrointestinal disorders (gastritis, IBS, IBD, etc.), musculoskeletal problems (arthritis, osteoporosis, etc.), hormonal and metabolic problems (mild obesity, light diabetes), initial stages of cancer, and many others.

Standing for many hours is hard and they prefer to sit for most part of the day. Physical performance after meals is very poor since respiratory and cardiovascular parameters can shift to the lower zone. The level of energy and physical desire to work are low. The over-excited brain easily invents excuses for laziness. Morning parameters are much worse (less than a 20 second CP) with all effects that are present for this zone.

Normal health

As we continue to climb up the table, the next row corresponds to the norms. The row "minus 2" reflects international norms for breathing: breathing frequency of 12 breaths per minute; 5.5 % for CO2 concentrations in the alveoli of the lungs (about 41 mm Hg); 40 second CP and 70 beats per minute for heart rate. People with normal health naturally have a so called "automatic pause" or period of no breathing (total relaxation of all respiratory muscles after each exhalation) during their unconscious breathing. The duration of the automatic pause is about 2 seconds.

People with normal health are able to run with strictly nasal breathing, safely take a cold shower (if they follow certain other rules), have good quality sleep, and are reasonably able to function on the social level (family, community, workplace, etc.).

Buteyko norms

Dr. Buteyko suggested his own standards for health so that one can be free from about 200 chronic conditions. As we see in the table, healthy people should have a breathing frequency of no more than 8 breaths per minute at rest, more than 60 second CP, over 6.5% CO2, less than 60 beats per min for heart rate, and at least 4 seconds for the automatic pause.

At this stage people enjoy and even crave physical activity. They are full of energy (when they have a normal blood glucose level). Standing throughout the day is easy and natural. Sleep is less than 5 hours and early morning parameters are not worse than evening ones. All tissues of the body are histologically normal (or in accordance with medical books), while chronic disorders are impossible.

Stages that correspond to super-health

Buteyko also identified 5 stages that correspond to super-health. Transition to the next row above the norm triggers certain biochemical processes and the appearance of lost abilities of the human body, including ability to digest wider varieties of fibers, painless childbirth, production of antibodies in saliva that prevent cavities and the formation of plague (no need to visit dentists 1-2 times every year), and some other effects.

Buteyko generalized this table to a wide variety of conditions (heart disease, cancer, diabetes, asthma, and many others). He considered this table as an important discovery since he applied for a patent. His patent application is provided below.

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(54)**METHOD OF ASSESSMENT OF HUMAN HEALTH**

(57) Abstract:

1. The method of assessing human health, including the definition of the parameters of functional systems and calculation of health indicators based on the above parameters other than those that form the contingent of the surveyed people who determine the parameter information by measuring the breath holding time of the person after a usual exhalation before the first inhalation without following disturbances in breathing, and then determine and record the basic parameters of main functional systems, and each of them is compared with the informational parameter of the investigated person and obtain the parameter, which is a marker of major functional systems and / or indicator of human health, create a method to assess health through establishment of the scale, while comparing the actual values of each parameter of health survey with the normal value, and based on the received data, health groups can be formed.

2. The method, according to Paragraph 1, but is different in that the scale of health has five categories with a positive sign that characterize the health status of people with different levels of super-endurance and seven categories with a negative sign, which characterize the state of poor health and / or disease in humans with varying degrees of disease severity.

5. How to increase CO2 and CP

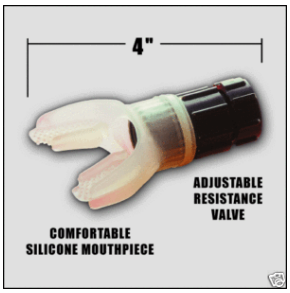
5.1 Methods suggested by K. P. Buteyko

There were 2 methods or types of exercise suggested by Dr. Buteyko in order to temporarily boost CO2 content in the human body: 1) physical exercise; and 2) reduced breathing exercise.

During these activities CO2 content in the lungs, blood and other cells is higher than at rest and we get a stronger desire to breathe (air hunger). If we are able to tolerate this air hunger and relax for a certain time (from 5 minutes to about 2 hours), our body triggers the adaptation of the breathing centre to lighter breathing and higher CO2 concentrations in cells and tissues after the session. It is not the activity itself, but rather the after-effects of the activity that have to be analyzed for health benefits. When breathing becomes lighter, the final CP (Control Pause after the breathing session or physical exercise) is higher, indicating favorable adaptations of the respiratory centre. (Note that the CP usually does not increase after rigorous physical exercise. Physical exercise has a definite positive effect only on the next morning CP, which is the main parameter of health for the Buteyko method.)

5.2 Breathing devices

Any breathing device or an apparatus that resists to air flow and/or traps part of the inhaled air for the next inhalation will change the air composition in the alveoli of the lungs and blood. If the person does not try deliberate overbreathing and can relax instead of panic, then any device or apparatus will increase inhaled CO2 (hypercapnia) and reduce inhaled O2 content (hypoxia) producing positive effects on all systems of the human organism.



Consider a simple dust mask and a surgical mask. Both breathing devices create resistance to air flow and trap some exhaled air with very large CO2 content. Breathing becomes slower and slightly deeper, but the body CO2 content gets higher. (Nasal breathing increase the body CO2 content in comparison with mouth breathing due to the same principle: greater resistance to air flow.) Hence, alveolar CO2 gets slightly higher, while O2 concentration is reduced.

Similar effects (higher CO2 and hypoxia in the lungs with subsequent adaptation of the breathing centre) takes place during paper rebreathing, a popular technique known for 2-3 centuries and used by young artists in theaters before performance in order to prevent nervousness and stage fear and to reduce panic.

Another type of exercise, with large temporary CO2 increase, is running with gas masks (those heavy gas masks with carbon filters which are used in the military services). During Soviet times there were many legendary stories from young rookies about their dramatic health improvements after having daily runs (up to 10 km!), while wearing such breathing devices. Obviously, if one would be able to tolerate such an ordeal, it should lead to large changes in the direction of less breathing and better health.

From a physiological viewpoint, when using these breathing devices we tolerate higher arterial CO2 levels than arterial CO2 values present at rest. The longer the use of the device and the larger the change, the higher the final change in the arterial CO2 after the session. Which devices are going to produce stronger effects? Clearly, the effects of a dust mask, surgical mask and paper bag are quite small since we hardly notice any air hunger. However, when we exercise and use, for example, a "PowerLung" or gas mask, while running, we experience stronger air hunger. Both devices create strong resistance to our breathing. Hence, the effects of these devices during physical exercise can be more lasting.

5.3 Are deep breathing and mouth breathing always bad?

"And finally one should not confuse the following concepts: we are speaking about breathing, which goes on day and night, about our basal breathing, foundation of life. Meanwhile, the system of yogi has separate breathing exercises. Therefore, it is practically unimportant for us how and what you do: feet upwards or downwards, through the right or left nostril, or by right or left side. We are interested in where you will arrive as a result of these exercises. If carbon dioxide increases, and breathing decreases, with each day, then this will ensure the transition of man into a super-endurance state…" Dr. Buteyko's lecture in the Moscow State University on 9 December 1969

"… The diver does about 100 dives 2 minutes each; for 200 minutes or 3 hours he is under water [every day]. This is most active work. But this is not that important. It is how he breathes the other 21 hours, instead of those 3 hours. If he breathes deeply, then he will be severely sick and will die. And if he breathes normally, he will somehow endure 3 hours. The key is not in the dive, but in the way the person breathes day and night. First, what is the basal breathing?" Dr. Buteyko's lecture in the Moscow State University on 9 December 1969

Is deep breathing (or large minute ventilation) always dangerous or disadvantageous for health? During physical exercise our breathing rate is also very large (up to 100-150 L/min), but CO2 in the lungs and arterial blood increases, as in the case of nasal breathing during physical exercise, causing gradual adaptation of the breathing centre to higher CO2 values. (This is the main mechanism, according to Dr. Buteyko why physical exercise is good for our health.) Buteyko also taught us that we are biochemical machines, not mechanical ones. In his words, a rigid approach to breathing ("any deep breathing is bad") is silly. Most importantly, we should see what is going on with the CO2 content in the human organism after training. Hence, we should find changes in the CP before and after the breathing session.

The same ideas should be applied to mouth breathing. During mouth breathing in normal life, alveolar CO2 content drops and nitric oxide is not inhaled in the lungs. Sick people, due to abnormal parameters of their breathing pattern (fast exhalations and absence of the autonomic pause), have greatly reduced NO (nitric oxide) intake. With healthy people, main NO accumulation takes place during automatic pauses so that they can inhale it in after the automatic pause.

Let us consider what is going on with these parameters (CO2 and NO) during mouth breathing through some device. If the device can trap a portion of the air exhaled, then this CO2 can be inhaled in during the next inspiration. Hence, breathing devices (paper bags, gas masks, dust masks, etc.) increase CO2 content in the blood and in all cells of the human body.

If the person does active inhalations through the mouth, while wearing or using the breathing device, then a small portion of the air (about 5-10% at least) will be inhaled through the nose involuntarily. Hence, the person will inhale NO that has been accumulated in the nasal passages during the automatic pause and slow inhalation through the mouth. If the person uses nasal clips, nitric oxide will be retained in sinuses and most likely get diffused through mucosal surfaces into the bloodstream. (Heart patients normally take

nitroglycerine, which is converted in the body into NO, sublingually, i.e. under the tongue. It should not be a problem for NO to diffuse through mucosal membranes.)

Therefore, mouth breathing through the device should not produce any negative effects even during the breathing session. Finally, when various breathing exercises are practiced, it is necessary to consider the after-effects of these breathing exercises on the main parameters of the human organism: most of all, changes in the CP and heart rate. This is exactly what Buteyko taught us: consider changes in basal breathing or breathing that is going on unconsciously, the remaining 23 hours per day.

5.4 Factors for success: knowledge, direction and attitude

Clear understanding of the goals of breathing retraining is also necessary for success. A student may practice the best breathing exercises for 1-2 hours every day, but if this student, after a breathing session, goes to neighbors and spends 2 hours talking non-stop about feeling great after the session, and thus hyperventilating, he or she will not get any positive changes in their breathing, since the goal of the breathing retraining is to change the breathing pattern or our unconscious (basal) breathing.

For those students, who learned the foundations of the Buteyko method and are aware about CO2 effects, body oxygenation, CP measurement, and main life-style factors, the result will be totally different since they will try, even unconsciously, to maintain light easy breathing patterns after the session. It is not the name of the device, or type of the session, or miracles hidden in the device, but what the student is going to do with his or her breathing after the session that also defines the lasting changes or final outcomes.

The general emotions or attitudes of the person towards breathing retraining, including perception of one's own abilities, skills, body, and many other related factors, will greatly influence the general progress. Simplicity, a business-oriented approach, modesty, and perseverance will definitely help to have better long-term results.

5.5 Restrictions, limits, and temporary contraindications

For people with transplanted organs

You should not have more than 30 seconds for your CP (preferably less than 27 s) at any time of the day to prevent rejection of the transplanted organs. When the CP gets more than 30 seconds (it corresponds to transition to the next health zone according to the Buteyko Table of Health Zones), the immune system becomes more sensitive to foreign tissues and cells and can launch an attack on these tissues in the attempt to repair them.

For people in life-threatening situations

Modern EM (Emergency Medicine) professionals developed many successful and useful methods and techniques for people in critical care and life-threatening states. Breathing retraining cannot replace these techniques (CPR, breathing pure oxygen, etc.) when people are unconscious or are unable to have a good control of their actions. Breathing exercises cannot quickly stop progression of metastasizing cancer.
Acute stages (exacerbations) of life-threatening conditions (infarct, stroke, cardiac ischemia, severe asthma attack, metastasizing cancer, septic shock, multiple organ failure, near-death experience, etc.)

Later, when one's state is stabilized, the person can start breathing exercises and apply those exercises that correspond to their new health state.

For people with acute bleeding injuries and brain traumas

Hyperventilation is a normal and useful reaction to bleeding injuries. Reduced CO2 content in the blood decreases blood flow to vital organs and other tissues of the human body. This prevents excessive blood losses and can save one's life. Emergency professionals even coined a term "permissive hyperventilation" that is used for people with, for example, brain trauma. Hence, one should not reduce or restrict their breathing in cases of existing brain traumas and acute bleeding injuries.

For people with blood clots

Reduced breathing dilates arteries and arterioles and makes blood thinner so that an existing blood clot could get loose and travel via the blood. The released clot may block blood flow through the artery leading to the brain or heart muscle and cause death. Hence, a person with a blood clot will benefit only from defensive measures in relation to breathing retraining (prevention of CP drops due to mouth breathing, sleeping on one's back, correct posture, etc.). These defensive activities prevent periods of hyperventilation that make blood thicker and the clot larger. Later, when the clot is dissolved or removed, the person can follow the program of breathing retraining adjusted to their new health state.

For people with loss of CO2 sensitivity

Loss of CO2 sensitivity takes place due to near death experience, carotid bodies removed, denervation of respiratory muscles (there are medical publications with abnormally high breath holding test results for all these situations), and life-style and environmental causes for genetically predisposed people (lack of deep stages of sleep, cortisol deficiency, calcium deficiency, EFA deficiency, magnesium deficiency, zinc deficiency, too low blood glucose, hyper and hypothermia, allergic reactions, etc.).

Practically, the last case (life-style and environmental causes) is the most frequent one. It can be episodic or chronic (for days or weeks). Many heart patients (they are predisposed to loss of CO2 sensitivity) can be driven into this state, if they use pauses, even the CP only, indiscriminately. The CP reflects their health, but they can feel worse after it; and repetitive pauses or just one MP can lead them in a state with no CO2 sensitivity.

When the person has experienced loss of CO2 sensitivity, their CPs do not reflect their health anymore. Generally, the CP reflects personal health for other 97% of people, but these people (with sensitivity to CO2 absent) can have disproportionally high CPs. For example, a student has 45 second CP (can be even up to 50-60 s), but his other symptoms are: irregular and visible upper chest breathing, high blood pressure (or asthma), poor and long sleep (over 8 hours), low energy level, etc, so that his clinical picture corresponds to about 15-20 second CP.

Such students require restoration of normal environmental and other parameters in order to restore normal CO2 sensitivity. Depending on the severity of the current state, these students require a special program based on their ability to have positive changes after a particular exercise.

For example, in the most severe cases a simple relaxation/meditation exercise (with no breathing control) can cause higher heart rates and lower CPs. When the condition is less severe, students can successfully meditate or practice relaxation only, but any attempt to reduce breathing or to breathe through a breathing device could lead to a worsened health state.

For pregnant women

The main danger for pregnancy is spontaneous abortion during a cleansing reaction due to very fast CP progress. For example, a pregnant woman starts with about 12-15 second CP and achieves 35-40 second CP in 4-6 days due to intensive breathing retraining. The immune system becomes highly sensitive to abnormal tissues and is able to reject transplanted organs, as we considered above. Similarly, the immune system at higher CPs can easily reject an embryo at the state when it is not yet attached to the womb of the mother (the first trimester of the pregnancy). The chances of spontaneous abortion are much higher, if the growing embryo accumulated medical drugs or if the mother had been taking medication before and after getting pregnant.

In order to prevent this, women should have a defensive program of breathing retraining based on prevention of CP losses (episodes of hyperventilation) due to overeating, mouth breathing, poor posture, morning hyperventilation, etc. The rate of CP progress should be limited:

- for women who used medical drugs or were exposed to toxic chemicals by 2 seconds in one week;
- for other pregnant women by 3 seconds in one week.

For type 2 diabetics

Intensive breathing sessions and quick CP growth increase the organism's sensitivity to circulating insulin and increase production of its own insulin due to better perfusion and oxygenation of the pancreas. This can happen due to a single breathing session or due to a fast CP growth within hours or days of first lessons. Hence, taking the same insulin dose can easily lead to hypoglycemic shock, which is potentially fatal. In order to prevent these complications, the student should:
1) eat a small snack immediately after a breathing session to prevent a drop in blood glucose level;
2) adjust daily insulin requirements to their current state by having good blood glucose control (periodic measurements), consulting their GP or family physician or endocrinologist about decreased blood glucose values, and asking them about reduced insulin intake.

Most diabetics, when they have the cooperation of their doctors, can safely decrease their insulin intake about 2 times after they start their program of breathing retraining described below.

For heart disease, migraine headaches, or panic attacks patients

Depending on the severity and type of the condition and some other factors, many of these patients can worsen their health state if they try very intensive breathing sessions accompanied by quick CO2 increase. For example, breath holds can trigger negative cardiovascular changes. Note that other groups of people can do breath holds without any negative effects, but blood vessels of heart patients can constrict due to sudden hypoxia. This effect was known to Dr. K. Buteyko who described it in his medical publication in the 1960's.

Therefore, when these patients have less than 20 second CP, they have 2 choices.
1. Inhale air through the nose and exhale through the breathing device.
2. Breathe in and out through the device but use a device with a very small volume for the plastic tube (no more than 50 ml). This can be achieved by using a very narrow plastic bottle.
In both cases, their breathing should remain regular (no breath holds).

Later, when their CPs are more than 20 seconds, these students can try a common breathing session with no air hunger and a comfortable state of well-being during the exercise. When they get over 30 second CP, no restrictions are necessary and they can join the main group in further breathing normalization.

Heart disease (aortic aneurysms; angina pectoris; arrhythmia; atherosclerosis (plaque buildup); cardiomyopathy; ciliary arhythmia (cardiac fibrillation); chest pain (angina pectoris); high cholesterol; chronic ischemia; congenital heart disease; congestive heart failure; coronary artery disease; endocarditis; extrasystole; heart murmurs; hypertension; hypertrophic cardiomyopathy; pericarditis; postmyocardial infarction; stroke; tachnycardia)
Migraine headaches and panic attacks

For people with respiratory disorders involving lungs

These groups of people should be gentle in relation to their damaged lungs tissue. Intensive mechanical stimulation of their lungs (in terms of amplitude and velocity of inhalation and exhalations) during initial stages of learning should be avoided. Later, they can gradually increase these parameters. This relates to people with:
Respiratory disorders involving the lungs (asthma, bronchitis, COPD, emphysema, cystic fibrosis, pneumonia, tuberculosis; pulmonary edema; etc.)

Hence, they should avoid any fast inhalation and exhalations, as well as maximum inflations and deflations of their lungs. All exercises are done in a comfortable way with good care for the current abilities of their lungs.

10. Appendixes

10.1 Testimonials of people who tried the DIY breathing device

Asthma (chronic and severe cases)

From: Steve, 46
I was an asthmatic for over 30 years since my early teens. In my late teens, I gained about 40 pounds and got all kinds of awful health problems. I was on two different inhalers (10-15 times a day) and nebulizers (1-2 a day). I was in the emergency room every month. During each trip I felt miserable and disgusting there. When I found Buteyko, my CP was 8 seconds. I started to practice breathing exercises with my own DIY device 3 times per day and my morning CP went up to about 25 s after 4 weeks. I was truly amazed. Now I'm in control of my personal health again: no medication at all. I am not reacting to triggers like mold, dust mites or other airborne irritants anymore. Even if you had asthma for decades, the Buteyko therapy can make a big difference! All my symptoms are gone… I breathe shallowly through my nose, and that has been the foundation of my success. Thank you, Artour, for your care about simple people.

From: Margaret, 58
I've had asthma since infancy..… Solution? It involves breathing exercises practiced diligently until the body learns to breathe normally. This program (www.normalbreathing.com) with the DIY breathing device is phenomenal. I have not used my puffer once since starting a month ago, compared with 15-20 puffs a day prior. My initial CP was about 9 s! In 3 weeks I was getting up to 25-30 s of oxygen in the body… Every day I go for a 7 km walk and not once have I feel tired or short of breath. In fact I felt strong and could have kept going. Every other time I have needed to stop for breath and use the puffer. The secret was/is the nose breathing. Close the mouth and breathe exclusively through the nose, even when you exercise. It is a miracle in my life. I am very thankful to you Artour for this manual.

From: Ahmed Hussein, 45
I am 45 years old and have been an asthmatic virtually all my life. I have had sinus problems most of my life. I had my first asthma attack at the age of 28 and was in the hospital for 5 days after coming close to death. My breathing stayed very heavy since then: I'd be winded walking from my bed to the bathroom in the morning. My drugs were at about $1,000 dollars a month for years... I found the DIY breathing retraining manual on the internet and after the second day of intensive breathing retraining, my sinuses cleared, the tightness in my chest disappeared, my lungs cleared and the secretions stopped. In addition I felt more relaxed, alert and generally well. I have been off all drugs in 2 weeks. My CP tripled since I started the breathing exercises and I am determined to get up to 60 s CP. Please, let me express here my gratitude for your help.

From: Greg Neil, 34
I had extremely bad asthma: using a ventolin inhaler very frequently and taking becloforte (corticosteroid, 6 puffs 3 times a day); uniphyllin tablets (twice a day); and prednisolone tablets (another corticosteroid, 10 to 20 mgs a day depending on my state). I was hospitalized a few times, including two times in an ER: oxymeter reading of 40, steroids and about 8 nebulizers in the ER alone with my pulse over 160. When I started Buteyko and DIY device exercises I had less than 10 s CP. I hated the idea of taping up my mouth but tried it. Now I tape up each night! It makes a huge difference in the morning. By the end of the first week, I stopped using ventolin and uniphyllin completely. In 3 weeks I have cut down all my medication, but my morning CP is still only about 18 s. The Buteyko method does require conscious awareness of our breathing for a year or more. Even if it takes longer than this to breathe shallowly automatically I will continue to apply the method and practice exercises with my breathing device as it has made such a huge difference to my asthma.

Bronchitis

From: Mike, 26
The breathing course has significantly changed my life. For over 3 years I was being treated for chronic bronchitis. I was getting more and more of steroids, antibiotics, and bronchodilators. Then I decided to try Buteyko breathing retraining using the DIY breathing device. Just after 1 month of breathing exercises with the DIY breathing device, I have had no bronchitis and no medication at all. I can easily go running now for 40 minutes with breathing only through the nose. My sleep and energy level are about 10 times better. I wish to thank you again for your sincere concern for helping us to overcome our various illnesses.

From: Cicilia, 47
I was panting at the slightest exertion, even from walking 50 m or climbing as few as 10 stairs. Since starting my breathing sessions (November 2009) I am now off all medication. This winter (2010) I have had no colds, flu or bronchitis. My immune system and general health has dramatically improved, all thanks to you Artour and to Buteyko.

From: Dorothy, 31
For 2 years I was desperate. I had severe chronic bronchitis. Winters were horrible: one bout of pneumonia or bronchitis after the other. My health was worsening month after month. One day I came across the Buteyko method on the internet. Then I downloaded the manual “Amazing DIY breathing device” from Artour. Within 3 weeks I reduced my medication to one puff in the morning. My general health has improved dramatically. I have not had a single infection after starting the Buteyko method. Thanks to you for committing your time to teach this valuable information.

Emphysema

From: Susan, 56
I only had 25% of my lungs left when I begun using the DIY water device I'm getting a lot better. Before starting this work, I was on a nebulizer machine every three hours 24/7 and that means I was up every three hours at night also and sometimes every hour. I was on every inhaler you can imagine. My doctors told me there was nothing else they could do for me. I was at the emergency room three times a week and in the hospital once a month sometimes for a week at a time and sometimes two weeks at a time. Today, it has been almost 3 years since I've used the DIY device. I started with a miserable 7 s CP. My lungs are now over 60% now and I can go days without using the nebulizer machine. If I have to use it, I will use it only once instead of 15 or 20 a day. For the first time in twelve years I'm beginning to have a life and hope, and it is all because of Buteyko. My morning CP is now about 25 s. I can take long walks now! I practice for 60 min every day (3 breathing sessions for 20 min with the DIY device) and will continue doing so. Thank you, Artour, for all your great work in writing and sharing this invaluable knowledge.

From: Arnold, 51
I suffered from sleep apnea for over 10 years and emphysema for 3 years. It got so bad that I was hospitalized 4 times to an emergency room. I was so breathless that I literally could do nothing more then lie on the couch while waiting for my wife to find me. I began the use of bronchodilators and steroids, as well as 24 hour O2 therapy. Once browsing the net, I downloaded the manual about breathing retraining and the DIY device. I re-read it 4 times. Within three days after getting the manual - I stopped bronchodilators and put aside the oxygen tanks. It has been hard but it works! In 5 months of practice I feel better than I have felt in 7 years. What are the changes? My sinuses are clear, no wheezing, no coughing; I have lost over 20 pounds, my sleep is great …

From: Mike, 68
I had emphysema and snoring with horrible mornings and foggy head. I used to wake 3-4 times in a night with very dry mouth and need to get up to drink water. My medications before the Buteyko course: Pulmicort, Prednisone, Atrovent, Rani, etc. After one month of breathing through my favorite toy (the DIY

device), I cut all medication except 2 puffs of Pulmicort per day. My sleep is now perfect. Now I am waking up in the morning with a clearer head (thanks to mouth taping and higher MCP) and have also stopped snoring. I will persist until I get my lungs normal and my CP is up to 60 s or more. It is very important to do breathing exercises daily and follow all other ideas related to life style factors. Each of them (nasal breathing only, sleeping on the left side or chest, eating only when really hungry, proper nutrients, etc.) are crucial for success. Many thanks for all your help.

Multiple chemical sensitivities

From: Anna, 51

I used to get a stuffy nose very easily and had multiple chemical sensitivities. My sense of smell was increased and I was highly sensitive to semi-strong scents like cigarettes, perfume, and paint. I got tightness in my chest every once in a while and upon regular exercise got easily winded. I noticed that upon starting breathing exercises, my nose cleared up within days. The biggest problem that existed for about five years before the course was an allergy-like reaction to cigarette smoke. This problem decreased after a week of the breathing exercises. It used to be that I had to run from the smell if I was anywhere near a lit up cigarette. Now I can even be in the same car with someone smoking, and not have to worry because I react like a regular person. You have no idea how that makes me feel after years of suffering and feeling like an outcast due to it. There's no way I will ever go back to the way I used to breathe. My morning CP is about 32 seconds. I am able to breathe normally around smoke without feeling sick for the first time in five years.

Chronic fatigue syndrome

From: Andrea, 27

I used to suffer from Chronic Fatigue Syndrome. Since 2004 I had to stay in bed for weeks feeling totally exhausted. I was so tired, I could hardly move my body parts. Two weeks after starting the breathing retraining my chronic fatigue is gone. My initial CP was 6 seconds. By the end of the first week I had build it up to 20 seconds. Now it is in the mid thirties. I am much more calm and relaxed. My cravings for coffee and sugar are gone. I am a different person. I am in control of my health and life.

From: Ron, 59

My chronic fatigue started about 15 years ago. For the first 4 years my health was getting progressively worse. Previously, I enjoyed daily runs, up to 15-25 km per day for about 2 decades. After getting sick, my physical fitness was greatly reduced. When I tried light jogging for 20-40 min only (it was too hard to run more) in cold weather, I would get sick with infections for the next 2-3 days: fever (over 38 degrees), a very soar throat, a husky voice, a totally blocked nose and a lot of mucus. My sleep was up to 11-12 hours per night and it was horrible: waking up several times every night, tossing in the bed for 30-60 min or more, and I also had headaches… My first CP measurement was 7 seconds. In 1 week of breathing retraining I was up to 20 s. In 2 months, I was up to 50-60 s of oxygen in the morning. My my sleep is down to 4 hours now: I fall asleep in about 1 minute and wake up in what feels like a moment later only to find out that 4 hours passed in a flash. After my sleep, I am again full of energy and have no desire to sleep more. I haven't had a single infection after I started my breath retraining. What is even more surprising is that when I got over 40 s MCP, I started to crave physical activity. I do not run, I virtually fly above ground with … light nasal breathing. I go running for 1.5-2 hours every day and feel even stronger than I was 20 years ago! It is the most incredible health therapy I ever tried and experienced.

Sinus Problems

From: Bret, 23

I had problems with sinuses for many years. My nose was totally blocked all the time. I lost all sense of smell. My initial CP was about 9 s. After finding out about Buteyko and his method, I got a manual and made my personal DIY breathing device. In a week I was able to breath through my nose most of the time. In

less than a month I achieved over 20 s CP 24/7. I can now sense different smells and aromas and my nose is clear. I should thank Dr. Buteyko and you, Artour for this amazing method.

Hypertension

From: Otto, 63

After three weeks of the DIY device practice my blood pressure went down to a normal level and it has stayed there ever since. My sleep and digestion have improved, I breathe easier and I can even run 5 km without feeling tired. It has been the most amazing change in my health and life! Thank you for your great work.

Hypertension and anxiety

From: Mary, 45

Thanks to breathing exercises I learned how to control panic attacks (when I feel that they are approaching) and keep my blood pressure normal. I do not take any blood pressure medication anymore. My CP increased from about 12 to 30 s. Another of the benefits of the breathing exercises is that I sleep really well, only for 6 hours, and wake up feeling refreshed. In the past, 9 hours of sleep were not enough. I plan to increase my physical activity up to 1.5-2 hours per day and get an even higher CP.

Chronic cough

From: Huan, 27

I got problems with chronic coughing after severe carbon monoxide poisoning. On top of that weeks later I developed various digestive problems (bloating, irritable bowel, GERD, etc.). For over 3 years I tried almost everything: supplements, herbs, fasting, colonic irrigation, acupuncture, etc. Some of these things could improve by symptoms but only for a few days. While searching the internet, I stumbled over Buteyko, but I dismissed it. Finally, out of desperation, I tried the breathing retraining program from the DIY-device manual written by Artour (www. Normalbreathing.com) and within the first 3 days I started to sleep much better and my cough bouts become about 4-5 times shorter in duration. Eventually, when my CP got up to 30 s, all coughing has stopped. I have even more energy now than prior to Buteyko. Thank you, Artour, for your wonderful work.

From: Michelle, 29

My 9-year son developed a chronic hacking cough at 7. His mouth and throat were always full of mucus and required clearing. For two years we were going from one specialist to another (respirologist, ear-nose-throat, allergy) and they could not find the cause. None of the drugs they suggested and we tried worked. After practicing the breathing exercises (“Amazing DIY Breathing Device”) for just one month, his cough is absolutely gone!

10.2 How to maintain nasal breathing 24/7

Breathing through the mouth is a sign of chronic hyperventilation. Healthy people (over 40 or 60 s CP) do not breathe through the mouth at all. If they try, their CP will be below 40 s. On the other hand, if you observe sick people, you will notice that breathing through the mouth is their frequent characteristic.

The very first step, in order to solve this problem, is education so that you completely realize importance of nasal breathing 24/7. Hence, importance of educational pages of this website.

The second step is your irrevocable decision to breathe through the nose all the time when you are awake. Any time when your nose gets blocked, you should apply Module 4-B (The Emergency Procedure for blocked nose). You can do it 10, 20, or 50 times per day.

If you find that your mouth is dry in the morning, consider the following experience of Dr. Buteyko's patients. In order to ensure nasal breathing during the night, in the 1960s Russian patients invented mouth taping. First of all, it is necessary to find out if one has this problem by checking dryness in the mouth just after waking up in the morning. If the mouth is dry, the person had mouth breathing. It could begin when the person went to sleep or it could appear at 3 or 4 am. In any case, just 20-30 min of mouth-breathing resets the breathing centre to lower CPs, and such patients, as a ruler, have less than 20 s CP in the morning. Moreover, if you have a malignant tumor and your daily CP is above 20 s, your tumor will grow only during the time of the night, when you breathe through your mouth. If you have sinusitis, the pathogenic bacteria in your sinuses will multiply and colonize new mucosal surfaces when you breathe through your mouth.

Organic damage to the heart muscle, growth of inflamed areas in the GI tract, advance of pathogens on your skin (in cases of eczema, psoriasis, etc.), and many other problems will appear if your mouth gets open during your sleep. Solution? You need to tape your mouth.

How to tape one's mouth at night to prevent mouth breathing

For mouth taping one needs a surgical tape and cream to prevent the tape sticking. Both can be bought in the pharmacy. Micropore (or 3M) and vaselin are popular choices. First, put a small amount of cream on the lips so that it is easy to remove the tape in the morning. Then take a small piece of tape and stick it in the middle, vertically, across the closed mouth. Some students prefer to put it along or horizontally, but a small piece in the middle is sufficient. If you are afraid to “seal” your mouth completely, tape only one half of the mouth leaving space for emergency breathing.

In 2006 one of my Buteyko colleagues, Dr. James Oliver, a GP from the UK and former president of the Buteyko Breathing Association made a presentation to the British Thoracic Society about the safety of mouth taping based on thousands of cases both in Russia and in the west. Previously he conducted a survey among us, Buteyko teachers and obtained the statistical data.

Taping at night normally should be a temporary measure. When one’s CP is above 20 s in the morning, mouth taping is not necessary.

Can mouth taping create distress?

Majority of students have no problems with mouth taping and they breathe only through the nose during the whole night. Their mouth is not dry in the morning and they report numerous benefits of mouth taping. However, some students may find it difficult and uncomfortable so that they remove the tape during the night. These incidents have physiological causes, including:

1. Sleeping on the back. If you turn on your back during night sleep, your breathing gets almost twice heavier and it will be very difficult to pump more air through the nose. Hence, learn the module devoted to prevention of sleeping on one's back.

2. Too warm sleep conditions. If your blanket is too warm, your breathing becomes deeper and bigger during sleep. You will wake up finding out that breathing through the nose is uncomfortable. To prevent overheating, use less warm clothes and blankets during sleep.

3. Carpets in your bedroom. Presence of carpets makes air quality tens or even hundreds times worse. During night sleep several cubic meters of air with millions of all these airborne particles, including dust, dust mites, their droppings, bacteria, viruses, etc. will enter through the nasal passages making them dryer and penetrating into bronchi and the lungs causing stress for the immune system and deep breathing. Sleeping in carpet-free rooms or covering carpets with plastic will solve this problem.

4. Very dusty pillow cases, blankets, and bed sheets create the same effect, as well as books, newspapers, hanging clothes, and old dusty curtains. Make sure that your bedroom has good air quality.

5. Closed windows during the night greatly worsen air quality in the bedroom due to poor air circulation and absence of air ions that make air cleaner. Either keep windows open or, if it is too cold or too noisy outside, buy an air ionizer/purifier and keep it running through the night.

6. Skin rashes due to extreme skin sensitivity. Try to find a hypoallergic tape or surgical paper tape. If rashes still a problem, you can sew together two clean socks making a circle. Wear it at night around your head so that to keep your jaw closed.

Nasal breathing during the day

Some older people may use mouth taping during the day, if they have memory problems or can forget about the role of nasal breathing due to other factors.

If you have family members or friendly co-workers and you want to prevent mouth-breathing during the day, tell them that your doctor (Artour Rakhimov, PhD) prescribed you nasal breathing 24/7. Ask them to pay attention to the way you breathe and remind you about your commitment to solve this problem.

Use stickers on your PC screen, doors, desks, etc. reminding you, "Breathe only through the nose". Keep a large mirror on your working desk so that you can see your face and the way you breathe through.
If you have children, promise them a small treat if they catch you breathing through the mouth.

Nasal breathing during physical exercise will be very important. Always slow down or take rest if you exercise so intensively that you get a strong urge to open your mouth.

Your struggle will not be long. You should increase your morning CP up to 20 s or more. Hence, take care about other Modules so that to move up to the safe zone and get busy with more advanced challenges in your life and your Buteyko journey.

10.3 How to Prevent Sleeping on One's Back

First of all, if you have doubts about importance of sleeping positions or about prevention of sleeping on one's back, you can conduct a simple test described above in the Morning hyperventilation section. Measure your body oxygenation (the CP test) after sleeping in different sleeping positions. You can use an electrical clock with elimination showing seconds or a ticking mechanical clock so that there is no need to turn the light on. Note that you should spend about 10-15 minutes in a certain position in order to achieve a stable metabolism correspondent to this sleeping position. Sleeping on the back is worst and causes lowest body oxygenation.

If you find that your CP does not decrease (or maybe even improve) after sleeping on your back, you must sleep on the back all the time. However, none of Russian doctors ever met or heard about such people. Why?

According to Dr. Buteyko, "Many severely sick patients remain sitting up, afraid to lie down. This is sensible. We should lie down only for a minimum amount of time, and only when sleeping. Our patients with deep breathing practice [breathing exercises], but cannot control their breathing at night, and hence, sleep is actually a poison for them. The longer he sleeps, the more chances that his breathing will be increased causing attacks. Therefore, we wake him up after 1-2 hours, he practices decreasing respiration...
Children, especially asthmatics, or the deep-breathing children turn themselves over on the tummy during sleep. And here it begins: the parents are on guard, the fight goes on, sometimes for years. The child turns on the tummy hiding its head under the pillow, but no, they turn him over to face up. Again and again he tries to rescue [himself], but they will not give in. There is no rest for him, nor for the others. And if we take a child sick with asthma, he sleeps on his back and wheezes. He turned on his tummy, the wheezing disappears in a minute. [He is] again on his back: in a minute the wheezing starts again."

Sleeping on the back for many sick people means about twice as much breathing and corresponding CP drop. This often causes acute symptoms due to early morning hours and death in severely sick people. Hence, Dr. Buteyko, his medical colleagues who practiced the Buteyko breathing method, and their numerous patients used variety of tools to prevent sleeping on one's back. Let me list some of them.

1. Some people were sleeping with a backpack to prevent turning on the back. This is one ("awkward") option.
2. It is possible to prop oneself from the sides with pillows.
3. Another option is to sew a pocket on the back of your night shirt and put a tennis ball there.
4. Or one can take a sock and wrap it around the middle of a belt making a knot. The belt can be positioned around the middle of the chest with the knot on the back of the person. The knot should be big enough to prevent the person from sleeping on the back and it would not wake the person up since it is soft.
5. Currently, the most popular solution is to take a double cotton layer (strip) of bed linen about 2 m long and 20-30 cm wide. Wrap it around self, make two knots on your chest and move them on your back. A simple scarf can be also used.

Practice shows, that sleeping on the back is the sign of low CP. This problem is present when the CP is about 20 s or less. Once, your morning CP is over 25 s, you are very unlikely to sleep on your back at all and there is no need to use any of these techniques.

10.4 Your personal daily log

Name: _____

Date	MCP	Time (hour)	Init. pulse	Init CP	Breath cycle and session time	Final pulse	Final CP	PE, min	Symptoms, medication and auxiliary activities

CP (Control Pause); MCP (morning Control Pause); RB (reduced breathing); PE (physical exercise in minuts per day). The final CP is measured after about 2-3 min break (no breathing control) after finishing the breathing session.

10.5 About the author Dr. Artour Rakhimov

* High school Honour student (Grade "A" for all exams)
* Moscow University Honour student (Grade "A" for all exams)
* Moscow University PhD (Math/Physics), accepted in Canada and the UK
* Winner of many regional competitions in mathematics, chess and sport orienteering (during teenage and University years)
* Good classical piano-player: Chopin, Bach, Tchaikovsky, Beethoven, Strauss (up to now)
* Former captain of the ski-O varsity team and member of the cross-country skiing varsity team of the Moscow State University, best student teams of the USSR
* Former individual coach of world-elite athletes from Soviet (Russian) and Finnish national teams who took gold and silver medals during World Championships
* Total distance covered by running, cross country skiing, and swimming: over 100,000 km or over 2.5 loops around the Earth
* Author of the publication which won Russian National 1998 Contest of scientific and methodological sport papers
* Author of the book:
- "***Oxygenate yourself: breathe less***" *(Buteyko Books; 94 pages; ISBN: 0954599683; 2008; Hardcover)*

and following e-books:
- "***What science and Professor Buteyko teach us about breathing***" *2002 (120 pages)*
- "***Breathing, health and quality of life***" *2004 (91 pages; Translated in Danish and Finnish)*
- "***Doctor Buteyko lecture at the Moscow State University***" *2009 (55 pages; Translation from Russian with Dr. A. Rakhimov's comments)*
- "***Normal Breathing: the Key to Vital Health***" *2009 (The most comprehensive world's book on Buteyko breathing retraining method; over 190,000 words; 305 pages)*

* Author of one of the largest world's website devoted to breathing retraining (www.NormalBreathing.com)
* Buteyko breathing teacher (since 2002 up to now) and trainer
* Health writer and health educator; author of hundreds of articles published on internet