## **Back To Chiropractic CE Seminars Breathing In The Office ~ 6 Hours**

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Marcus Strutz, DC Back To Chiropractic CE Seminars

# Breathing: in the office

Presented by Jamie He, D.C.





Take care of the

MIND & SPINE



**JUST** 



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## Learning Objectives 6 Hours on Respiration problems in the office

- Section 1: Overview of common respiratory diseases in 2020 and discuss different causes for breathing difficulty
- Section 2: Discuss the relationship between posture and breathing pattern, common spinal complaints we see in a chiropractic office; review anatomy and physiology of the respiratory muscles
- Section 3: Discuss what we can do in the office to help reeducate patients' breathing pattern and improve overall wellness; introduce various types of breathing exercises

### Overview

- ▶ Be familiar with the common types of respiratory diseases
- Differentiate common causes of shallow breathing from history taking
- Review of primary and accessory respiratory muscles
- Understand the importance of posture in proper breathing
- Address the relationship between improper breathing and spinal pain
- Provide options to re-educate patients' breathing pattern

## Section 1

- Overview of common respiratory diseases in 2020
- ► The WHO Big Five
- Discuss different causes for breathing difficulty: symptoms and history for each

## Why talk about the respiratory system?

According to the WHO, "Respiratory diseases are leading causes of death and disability in the world. About 65 million people suffer from chronic obstructive pulmonary disease (COPD) and 3 million die from it each year, making it the third leading cause of death worldwide. About 334 million people suffer from asthma, the most common chronic disease of childhood affecting 14% of all children globally. Pneumonia kills millions of people annually and is a leading cause of death among children under 5 years old. Over 10 million people develop tuberculosis (TB) and 1.4 million die from it each year, making it the most common lethal infectious disease. Lung cancer kills 1.6 million people each year and is the most deadly cancer. Globally, 4 million people die prematurely from chronic respiratory disease. At least 2 billion people are exposed to indoor toxic smoke, 1 billion inhale outdoor pollutant air and 1 billion are exposed to tobacco smoke."

https://www.who.int/gard/publications/The\_Global\_Impact\_of\_Respiratory\_Disease.pdf

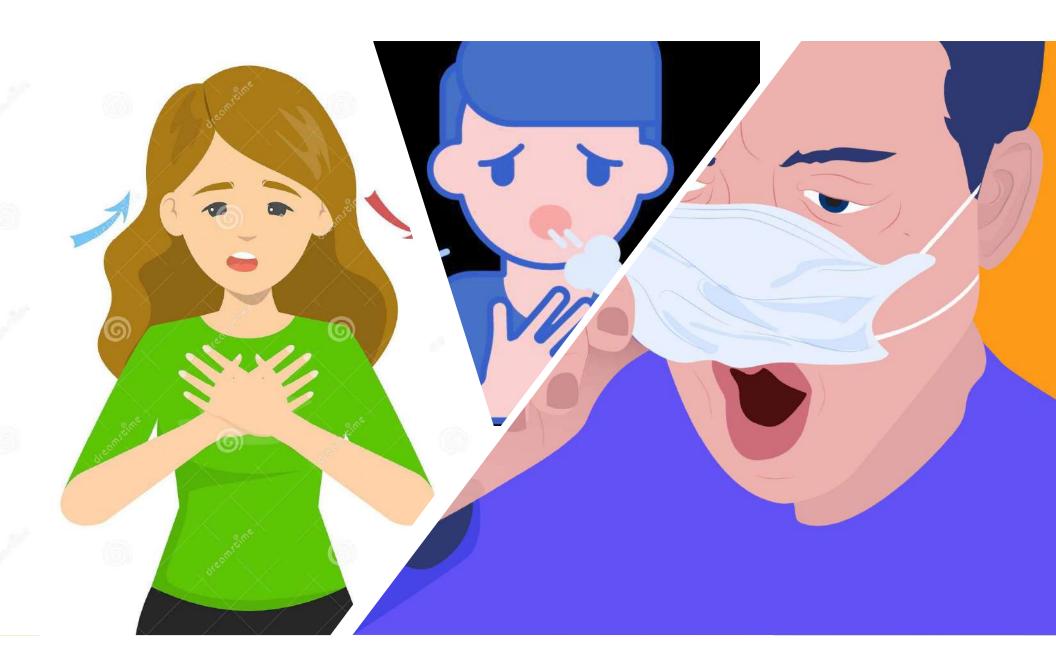
## Why talk about it in a chiropractic office?

We all know that chiropractors are **NOT** the first healthcare provider who comes to mind when patients seeking help for respiratory problems.

#### **BUT**

With the high prevalence of respiratory disease in our society, the chance of patients walking into our office with a secondary complaint of trouble breathing is high.

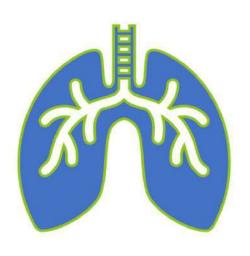
It is very important for us to differentiate and rule out whether the cause is a medical condition or a simple breathing mechanics that chiropractic adjustments can improve.



## Common secondary complaint regarding breathing in a chiropractic office

- Shallow breathing or unable to take a deep breath
- Rapid, shallow breathing
- Shortness of breath

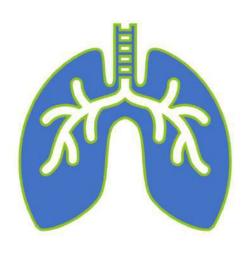
## Shallow breathing



- An improper breathing pattern
- Shorter inhaling and exhaling than normal breathing but with an equal cadence.
- ▶ Patient typically draws minimal breath into the lungs, usually by drawing air into the chest area using the <u>intercostal muscles</u> rather than throughout the lungs via the <u>diaphragm</u>.

Shallow breathing can result in or be symptomatic of <u>tachypnea</u> and <u>hypoventilation</u>.

## Tachypnea

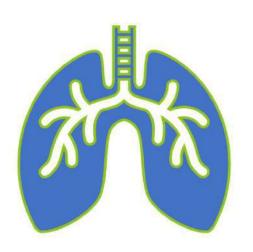


- Rapid, shallow breathing pattern
- Occurs when you take more breaths than normal in a given minute

When a person breathes rapidly, it's sometimes known as <a href="https://hyperventilation.">hyperventilation</a>, but hyperventilation usually refers to rapid, deep breaths.

The average adult <u>normally</u> takes between <u>12 to</u> <u>20 breaths</u> per minute.

## **Shortness of Breath**



- Medically know as dyspnea
- An intense tightening in the chest, air hunger, difficulty breathing, breathlessness or a feeling of suffocation

Shallow breathing can become shortness of breath when normal tasks are no longer possible or if feelings of anxiousness start to occur.

## Two main triggers for shortness of breath

1. Increased CO2 level

Faster Breathing 

CO2 in blood 

Artery receptors set new threshold of CO2 

Breathing rate

Preach threshold threshold of CO2

Respiratory

Shortness of breath

**Exercises** 

conditions

## Common conditions that cause difficulty breathing

- Asthma
- Chronic obstructive pulmonarydisease (COPD)
- ► Infection (TB, acute lower respiratory tract infection, pneumonia)
- Pulmonary embolism
- Diabetic ketoacidosis
- Anxiety/Panic attacks

- ► Heart failure
- Transient tachypnea of the newborn
- Other serious lung disease (lung cancer)
- New member COVID-19
- ► The obvious one pregnancy
- ► The hidden one poor posture

## The Big Five

Most common causes of severe illness and death worldwide.

- Asthma
- ► COPD
- ▶ Tuberculosis
- Acute lower respiratory tract infection
- Lung cancer

https://www.who.int/gard/publications/The\_Global\_Impact\_of\_Respirat ory\_Disease.pdf

### **Asthma**

#### **Symptoms:**

- Shortness of breath
- Chest tightness or pain
- Wheezing when exhaling, which is a common sign of asthma in children
- Trouble sleeping caused by shortness of breath, coughing or wheezing
- Coughing or wheezing attacks that are worsened by a respiratory virus, such as a cold or the flu

- Smoker
- Exposure to secondhand smoke
- Family history of asthma
- Overweight
- Other allergic condition
- Exposure to exhaust fumes or other types of pollution
- Exposure to occupational triggers, such as chemicals used in farming, hairdressing, and manufacturing

## Chronic obstructive pulmonary disease (COPD)

#### **Symptoms:**

- Shortness of breath, especially during physical activities
- Wheezing
- Chest tightness
- A chronic cough that may produce mucus (sputum) that may be clear, white, yellow or greenish
- Frequent respiratory infections
- Lack of energy
- Unintended weight loss (in later stages)
- Swelling in ankles, feet or legs

- Smoker
- Asthma
- Occupational exposure to dusts and chemicals
- Exposure to fumes from burning fuel
- Genetics alpha-1-antitrypsin deficiency

### **Tuberculosis**

\*\*can also affect other parts of the body - kidneys, spine, or brain\*\*

#### Symptoms of ACTIVE TB

- Coughing that lasts three or more weeks
- Coughing up blood
- Chest pain, or pain with breathing or coughing
- Unintentional weight loss
- Fatigue
- Fever
- Night sweats
- Chills
- Loss of appetite

- Weakened immune system
- Traveling or living in certain areas (Africa, eastern Europe, Asia, Russia, Latin America, Caribbean Islands)
- Poverty and substance use
- Living or working with someone infected with TB



## Acute lower respiratory tract infection

#### **Symptoms:**

- Congestion, either in the nasal sinuses or lungs
- Runny nose
- Cough
- Sore throat
- Body aches
- Fatigue
- Fever and chills
- Difficulty breathing

Dizziness

- Very young or old age
- Crowded living conditions
- Weakened immune system
- Lack of immunization
- Exposure to tobacco smoke
- Exposure to indoor air pollutants

## **Lung Cancer**

#### **Symptoms:**

- A new cough that doesn't go away
- Coughing up blood, even a small amount
- Shortness of breath
- Chest pain
- Hoarseness
- Losing weight without trying
- Bone pain
- Headache

- Smoker
- Exposure to secondhand smoke
- Previous radiation therapy
- Exposure to radon gas
- Exposure to asbestos and other carcinogens
- Family history of lunch cancer



### Pneumonia

#### **Symptoms:**

- Chest pain when you breathe or cough
- Confusion or changes in mental awareness (in adults age 65 and older)
- Cough, which may produce phlegm
- Fatigue
- Fever, sweating and shaking chills
- Lower than normal body temperature-(in adults older than age 65 and people with weak immune systems)

- Nausea, vomiting or diarrhea
- Shortness of breath

#### **History/Risk Factors:**

- Age <2 or >65
- Being hospitalized
- Chronic disease
- Smoker

Weakened immune system



## Pulmonary embolism

#### **Symptoms:**

- Shortness of breath
- Chest pain
- Cough
- Rapid or irregular heartbeat
- Dizziness
- Excessive sweating
- Fever
- Leg pain and/or swelling
- Clammy or discolored skin (cyanosis)

- Prolonged immobility
- Other medical conditions (heart disease, cancer, COVID-19, disorders affect clotting)
- Smoker
- Overweight
- Supplemental estrogen
- Pregnancy



## Diabetic ketoacidosis

#### Symptoms:

- Excessive thirst
- Frequent urination
- Nausea and vomiting
- Stomach pain
- Weakness or fatigue
- Shortness of breath
- Fruity-scented breath
- Confusion

- Have type 1 diabetes
- Frequently miss insulin doses



### **Panic Attacks**

#### Symptoms:

- Sense of impending doom or danger
- Fear of loss of control or death
- Rapid, pounding heart rate
- Sweating
- Trembling or shaking
- · Shortness of breath or tightness in your throat
- Chills
- Hot flashes
- Nausea
- Abdominal cramping
- Chest pain
- Headache

- · Dizziness, lightheadedness or faintness
- Numbness or tingling sensation
- Feeling of unreality or detachment

- Family history of panic attacks or panic disorder
- Major life stress, such as the death or serious illness of a loved one
- A traumatic event, such as sexual assault or a serious accident
- Major changes in your life, such as a divorce or the addition of a baby
- Smoking or excessive caffeine intake
- History of childhood physical or sexual abuse

### Heart Failure

#### **Symptoms:**

- Shortness of breath (dyspnea) when you exert yourself or when you lie down
- Fatigue and weakness
- Swelling (edema) in your legs, ankles and feet
- Rapid or irregular heartbeat
- Reduced ability to exercise
- Persistent cough or wheezing with white or pink blood-tinged phlegm
- Increased need to urinate at night

- Swelling of your abdomen (ascites)
- Very rapid weight gain from fluid retention
- Lack of appetite and nausea
- Difficulty concentrating or decreased alertness
- Sudden, severe shortness of breath and coughing up pink, foamy mucus
  - Chest pain if your heart failure is caused by a heart attack

## Heart Failure (cont.)

- Hypertension
- Coronary artery disease
- Heart attack
- Diabetes
- Certain medication (NSAIDs, antiarrhythmic, for diabetes, hypertension, cancer, blood, neurological conditions, urological conditions...)
- Sleep apnea

- Congenital heart defects
- Valvular heart disease
- Viruses
- Substance use
- Obesity
- Irregular heartbeats



## Transient tachypnea of the newborn (TTN)

#### **Symptoms:**

- Rapid breathing, which means over
   60 breaths per minute
- Labored breathing, including grunting and moaning
- Nostril flaring
- Bluish skin (cyanosis)
- Appearance of the chest sinking under the ribcage with each breath (also called retractions)

#### **History/Risk Factors:**

Being a newborn





## COVID-19

#### Symptoms:

- Fever
- Cough
- Tiredness
- Shortness of breath or difficulty breathing
- Muscle aches
- Chills
- Sore throat
- Runny nose

- Headache
- Chest pain
- Pink eye (conjunctivitis)

- Close contact with someone who carries the virus
- Being coughed or sneezed on by an infected person



## Pregnancy - the obvious one

#### Early pregnancy - hormonal change

• a normal increase in the hormone progesterone causes increased breathing frequency. This hormone expands the lung capacity, allowing blood to carry large quantities of oxygen to the fetus

#### **Late pregnancy** - physical change

growing baby pushes the uterus against the diaphragm

## Poor posture - the hidden one

#### **Symptoms:**

- Anterior head carriage
- Rounded shoulders
- Potbelly
- Bent knees when standing or walking
- Shallow or improper breathing pattern
- Back pain
- Body aches and pains
- Muscle fatigue
- Headache

- Prolonged sitting
- Sedentary lifestyle
- Joint stiffness
- Muscle tightness
- Poor core stability
- Poor ergonomic work stations
- Scoliosis



## Section 2

- Review anatomy and physiology of the respiratory muscles
- Discuss the relationship between posture and breathing pattern
- Common spinal complaints we see in a chiropractic office



## **Primary Respiratory Muscles**

#### Primary inspiratory muscles:

- Diaphragm (main one)
- External intercostals

#### Normal/Relaxed expiration:

Passive process of inspiratory muscles relaxation



#### Muscles involved in forceful expiration:

- Internal intercostals
- Intercostalis intimi
- Subcostals
- Abdominal muscles



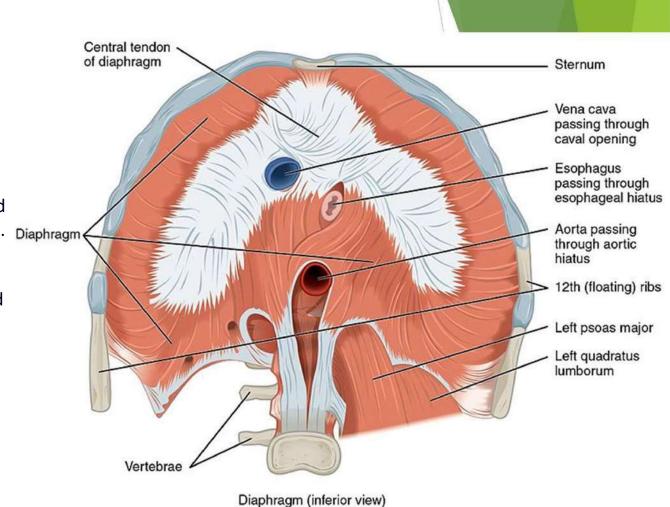
## Diaphragm

Origin: Xiphoid process (posterior surface), lower six ribs and their costal cartilage (inner surface) and upper three lumbar vertebrae as right crus and upper two lumbar vertebrae as left crus.

Insertion: central tendon

Function: contracts and pulls downward

for increase thoracic cavity



## Intercostal muscles

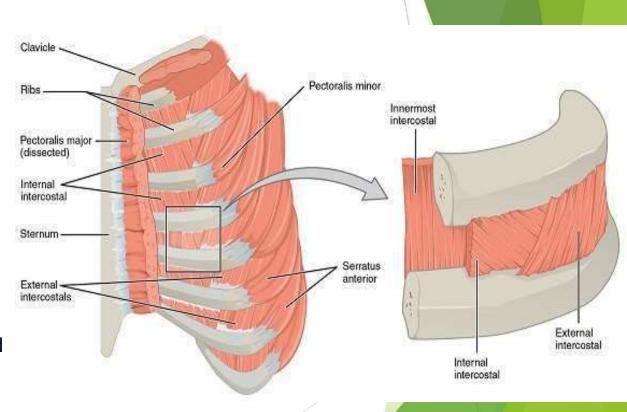
#### External intercostal

- Origin: inferior border of rib above and
- Insertion: superior border of rib below

#### Innermost intercostal:

- Origin: from the costal groove of the rib above and
- Insertion: the superior border of rib below

**FUNCTION OF THE GROUP:** contract and pull upward to increase thoracic cavity



#### Internal intercostal

- Origin: from the costal groove (lower part of inner surface of rib near the inferior border) of the rib above and
- Insertion: upper border of rib below

\*\*Only the interchondral part aids in inhalation. Other parts take part in exhalation.\*\*



## **Accessory Respiratory Muscles**

#### Accessory inspiratory muscles:

- Sternocleidomastoid
- Scalenus anterior, medius, and posterior
- Pectoralis major and minor
- Inferior fibres of serratus anterior and latissimus dorsi
- Serratus posterior superior



#### Accessory expiratory muscles:

- Abdominal muscles: rectus abdominis, external oblique, internal oblique, and transversus abdominis
- ► The lowest fibres of iliocostalis and longissimus
- Serratus posterior inferior
- Quadratus lumborum

## When are they recruited?

- Heavy, labored breathing (i.e. during fast running)
- Dysfunctional/improper breathing patterns.
  - Sometimes, problems like chronic obstructive pulmonary disease (COPD), asthma, or cystic fibrosis cause difficulty breathing. In these conditions the accessory muscles are recruited to improve gas exchange.

## Sternocleidomastoid

#### Origin:

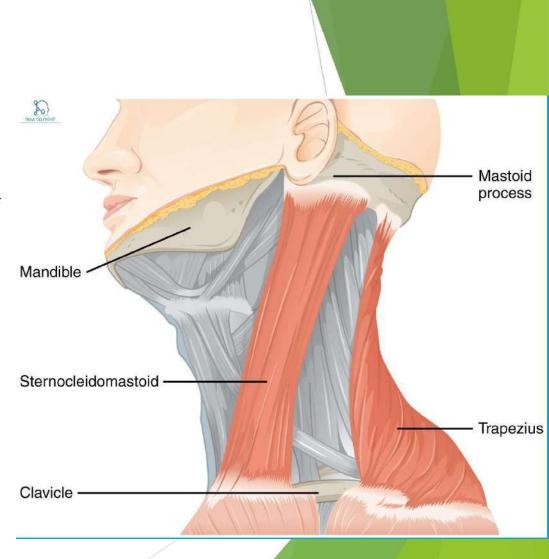
- Sternal head: superior part of anterior surface of manubrium sterni
- Clavicular head: superior surface of medial third of the clavicle

#### Insertion:

- Lateral surface of mastoid process of the temporal bone
- Lateral half of superior nuchal line of the occipital bone

#### **Function:**

Elevates sternum



### Scalene muscles

#### **Anterior**

- Origin: anterior tubercle of transverse processes of vertebrae C3-C6
- Insertion: anterior scalene tubercle of rib 1, superior border of rib 1 (anterior to subclavian groove)

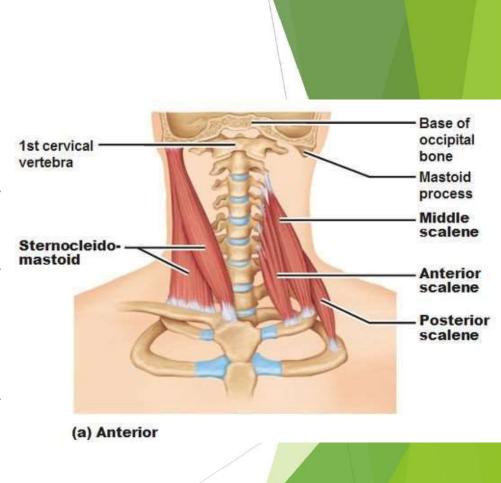
#### Middle

- Origin: posterior tubercles of transverse processes of vertebrae C2-C7
- Insertion: superior border of rib 1 (posterior to subclavian groove)

#### **Posterior**

- Origin: posterior tubercles of transverse processes of vertebrae C4-C6
- Insertion: external surface of rib 2

FUNCTION OF THE GROUP: elevates rib 1 and 2



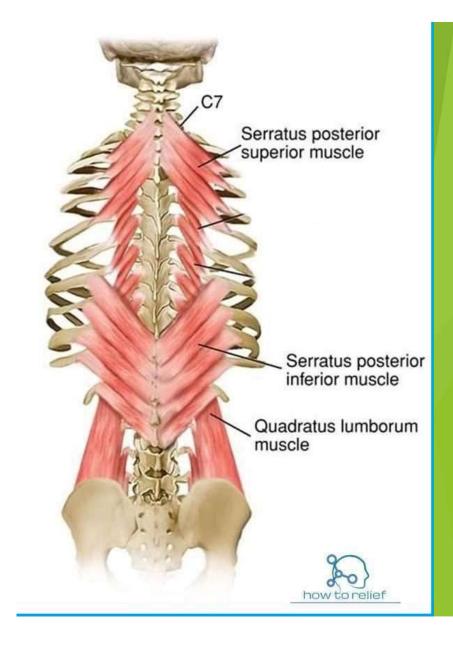
## Serratus posterior musles

#### Serratus posterior superior

- Origin: C7-T3 vertebrae spinous process and Nuchal ligament.
- ▶ Insertion: at upper border of 2nd-5th ribs
- Function: elevate the ribs during inspiration and has a stabilization role for thorax

#### Serratus posterior inferior

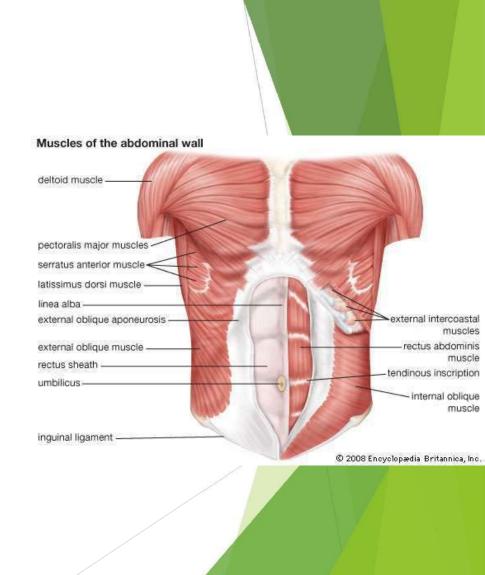
- ▶ Origin: T11-L2 vertebrae spinous process
- Insertion: at lower border of 9th-12th ribs
- ► Function: depress the ribs during expiration



## Abdominal muscles

- Rectus abdominis
- External oblique
- Internal oblique
- Transversus abdominis

**FUNCTION OF THE GROUP:** pulls ribs down, compress abdominal contents thus pushing diaphragm up

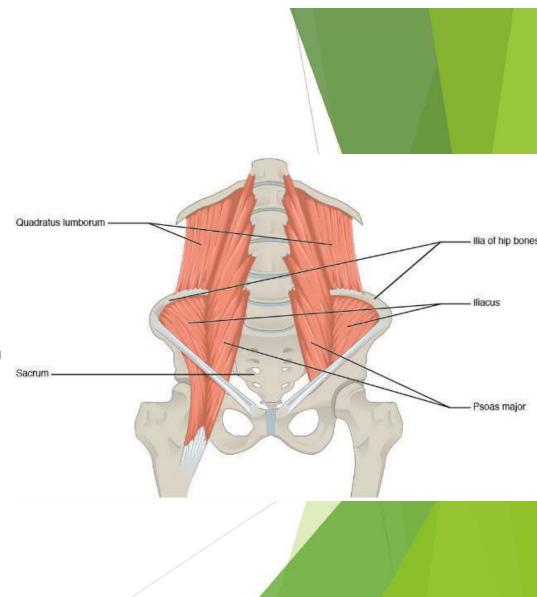


## Quadratus lumborum

**Origin:** Iliolumbar ligament and internal lip of Posterior iliac Crest

**Insertion:** Medial half of lower border of 12th rib and tips of transverse processes of lumbar vertebrae

Function: Fixes the 12th rib to stabilize diaphragm attachments during inspiration



#### Muscles of inspiration

#### Accessory

Sternocleidomastoid (elevates sternum)

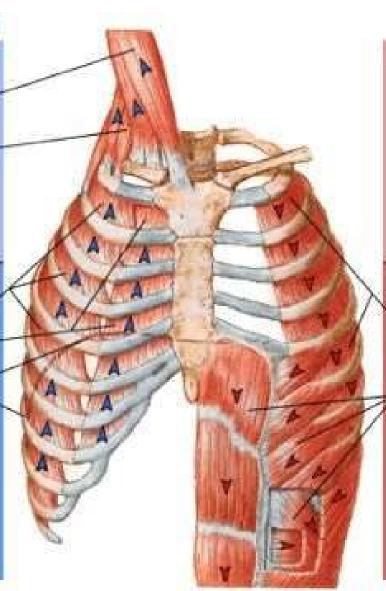
Scalenes Group (elevate upper ribs)

Not shown: Pectoralis minor

#### Principal

External intercostals interchondral part of internal intercostals (also elevates ribs)

Diaphragm (dome descends, thus increasing vertical dimension of thorac cavity; also elevates lower ribs)



#### Muscles of expiration

#### Quiet breathing

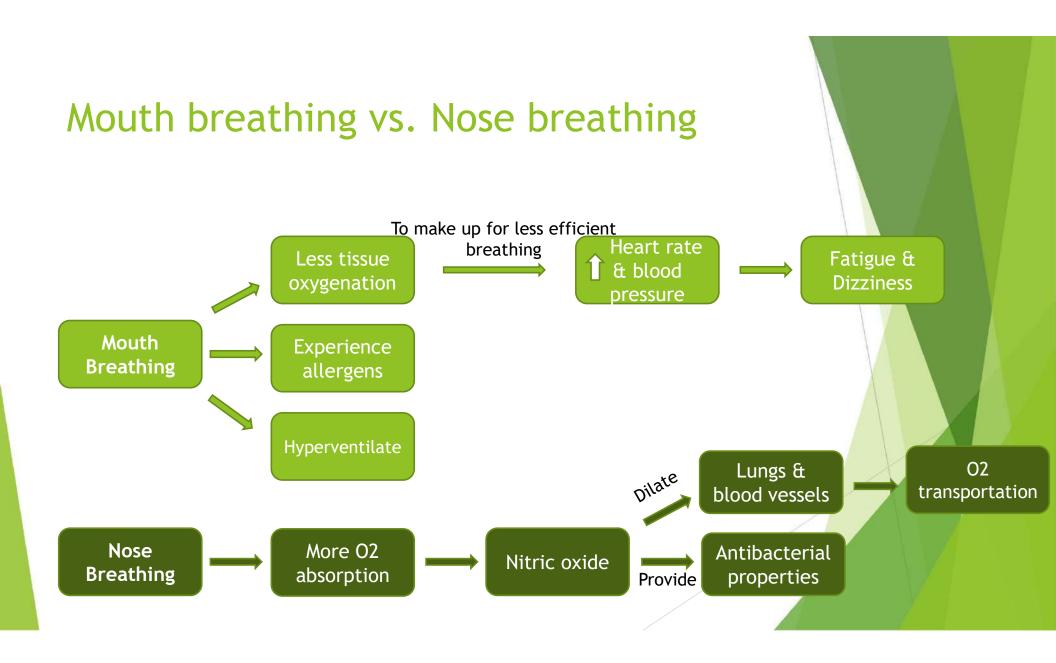
Expiration results from passive, elastic recoil of the lungs, dib cage and diaphragm

#### Active breathing

internal intercostals, except interchondral part (pull ribs down)

Abdominals (pull ribs down, compress abdominal contents thus pushing diaphragm up)

Note shown: Quadratus lumborum (pulls ribs down)

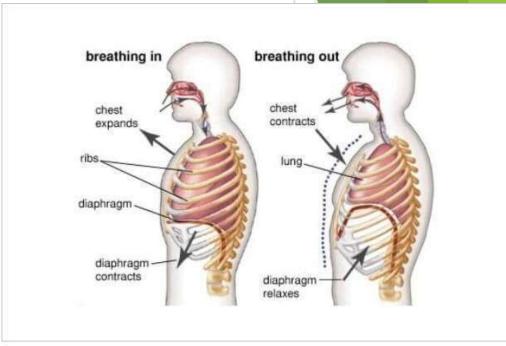




## Proper Breathing at Rest

#### Belly Breathing / Relaxation Breathing

- Most efficient
- Contraction of diaphragm pulls the lungs downward, creating negative pressure inside the chest
- Should be effortless and quiet
- Through the nose facilitates the intake of nitric oxide, which helps with oxygen transportation throughout the body



Source: http://medicienlerprises.c

#### **BENEFITS**:

- ▶ Promotes *parasympathetic* ("rest and digest") state
  - ► Helps regulate blood pressure
  - ▶ Optimizes ventilation, gas exchange and arterial oxygenation
  - ▶ Maximizes vagal tone
  - ▶ Optimizes the amount of cardiorespiratory reserve that could be called upon in times of intense physical or mental stress or activity

## Proper Breathing during Exercises

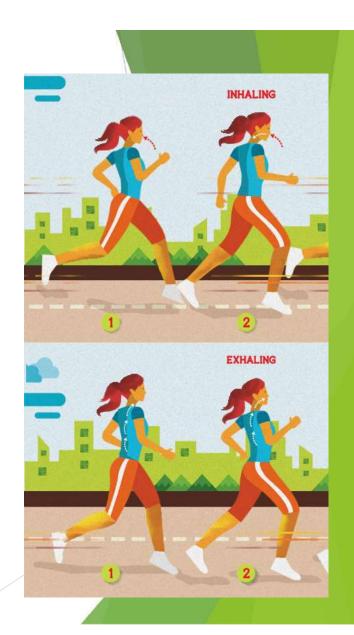
Still better to breathe through the nose than the mouth

#### **BENEFITS**

- ▶ Deliver the oxygen our bodies need to perform functions properly
- ► Help athletes exercise longer

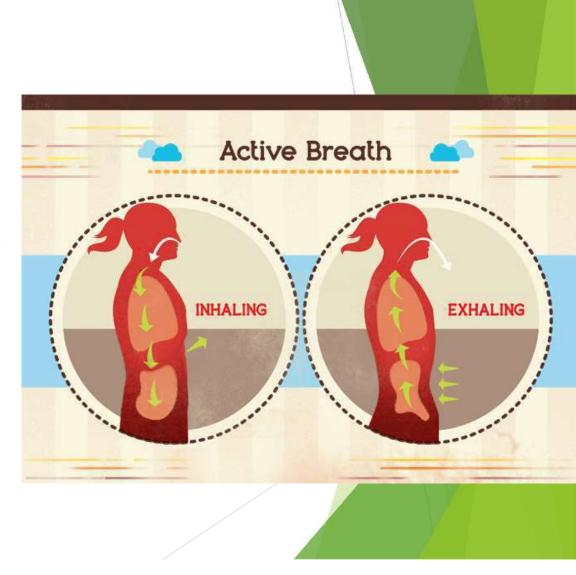
#### Running

- 2:2 rhythm Take one breath for every two foot strikes taking two steps (one left, one right) while breathing in and two steps while breathing out
- Through the mouth less resistance



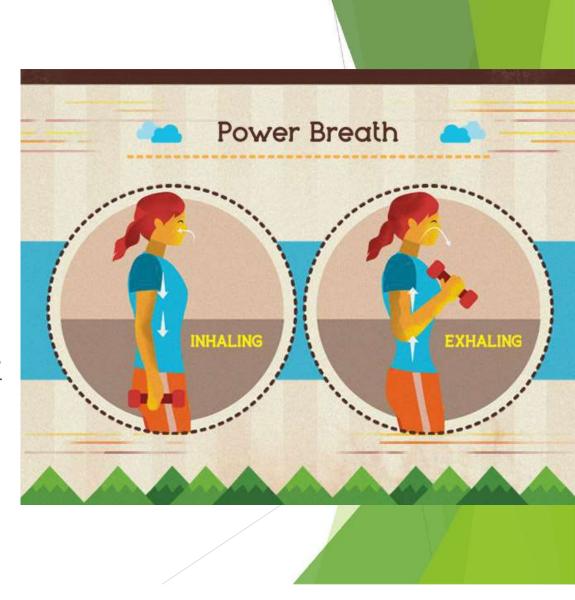
#### High-intensity sports

- Deep breaths using belly breathing
- Brace the core for stability and protect the spine



#### Strength training

- Power breath involves core stability and a focus on long powerful exhalations
- Exhale on exertion with a powerful exhalation, engage the transverse abdominus and the pelvic floor muscles at the same time as lifting, pressing, or pulling the weight, then inhale deeply and then pause at the end of the inhalation

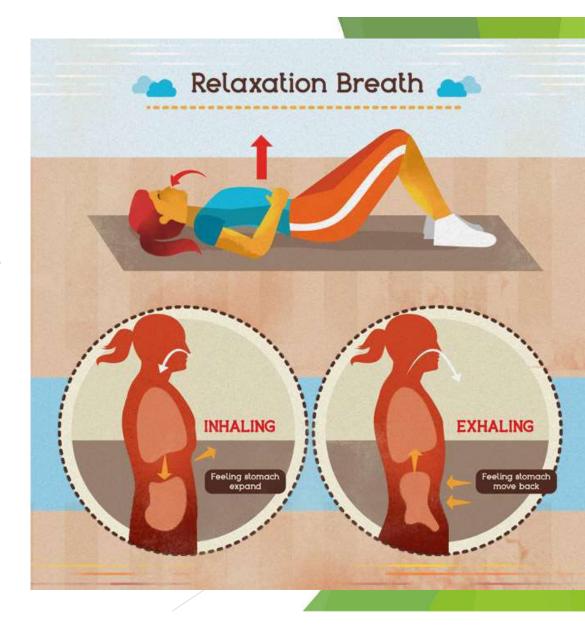


#### Yoga

- Belly breathing / Relaxation breathing
- sama vritti, or "equal breathing," match an equal-length inhale to an equal-length exhale

#### Reference:

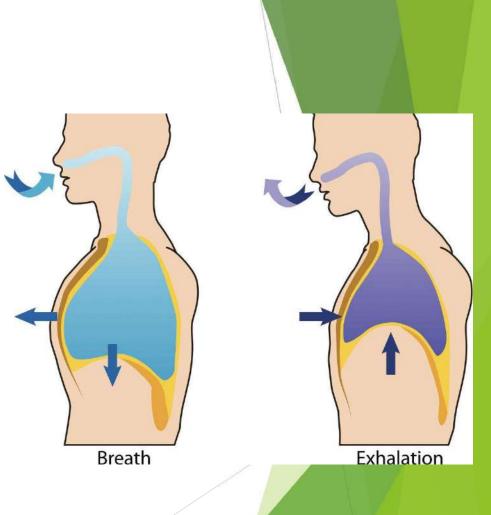
McConnell, Alison. *Breathe Strong Perform Better*. Human Kinetics, 2011



## Improper Breathing

#### **Chest Breathing**

- Chest rise up when inhale
- Primarily uses accessory respiratory muscles
- Does not provide stability and protection to the spine
- Strains muscles in the neck and shoulders



## Physiological Effect of Improper Breathing

- Recruits accessory respiratory muscles over-inflate and stay hyperinflated in our ribcage
- ▶ Lowers body's oxygen level and increases the carbon dioxide level in blood
- Increases stress level and blood pressure
- Increases neck and shoulder tension
- ► Triggers **sympathetic** ("fight or flight") response more often

## Posture and Breathing

- Good posture will create the physical space we want by properly positioning our diaphragm in relation to our rib cage. Drawing breath in through the "belly" allows us to take in more breath and fill the diaphragm.
- Poor posture forces our bodies and organs into unnatural postures, which allow our muscles to become stiff and restrict our breathing

## How can poor posture can shortness of breath?

- One of the main reasons it does this is by limiting your ability to access your diaphragm and belly breathe.
- ➤ Your brain can't get the oxygen it requires, and you experience a sensation of 'air hunger' so it will recruit your back up breathing muscles that we have discussed previously. These need to work more frequently to get the required oxygen intake which makes you breathe fast and shallow.

## Common posture-related spinal complaints

#### Neck pain

- Has an annual prevalence rate exceeding 30% among adults in the US; nearly 50% of individuals will continue to experience some degree of chronic neck pain or frequent occurrences.
- Among adults, 20% to 70% will experience neck pain that interferes with their daily activities during their lifetime.
- Neck pain affects 15.1% of the United States' general population every 3 months, and ranks fourth in global disability.

#### Lower back pain

- Approximately 29% of the US population reported experiencing lower back problems in 2019
- Back problems are more common in adult women than men; nearly one-third of the female adult population suffers from LBP, compared to one-quarter of the male adult population. Approximately 31% of men acknowledged that their condition affects their employment compared to 20% of women
- Worldwide, back pain is the single leading cause of disability, preventing many people from engaging in work as well as other everyday activities.
- Back pain is one of the most common reasons for missed work. One-half of all working Americans admit to having back pain symptoms each year.
- Worldwide, years lived with disability caused by low back pain have increased by 54% between 1990 and 2015.
- Low-back pain costs Americans at least \$50 billion in health care costs each year—add in lost wages and decreased productivity and that figure easily rises to more than \$100 billion.

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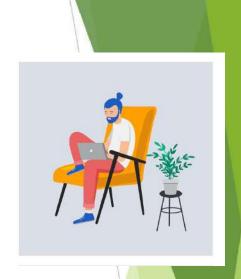












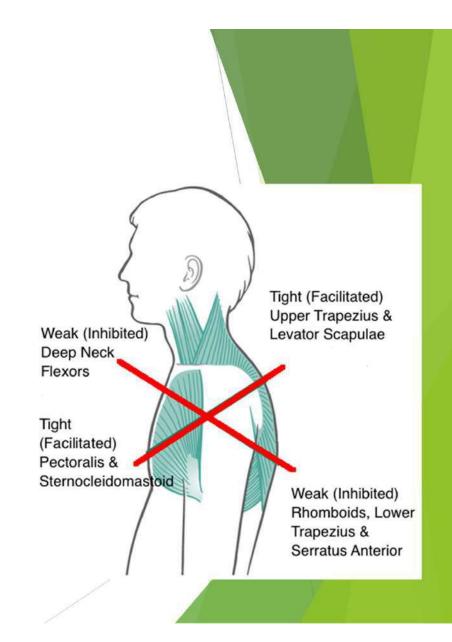


## Risks from the ongoing trend



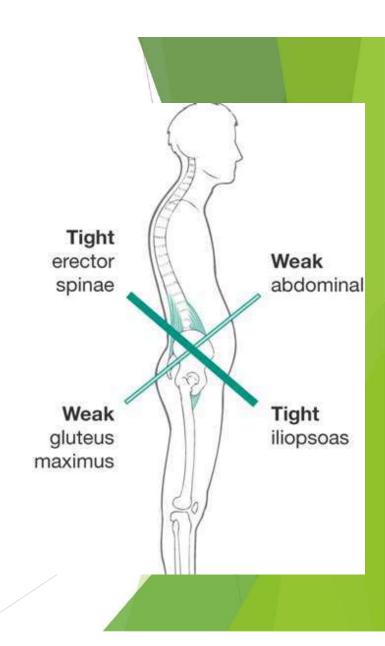
#### Upper cross syndrome, aka Tech neck

- Tight muscles pectoralis major and minor, SCM, levator scapulae, upper trapezius
- Weak muscles rhomboid major and minor, serratus anterior, lower and middle trapezius
- Symptoms:
  - Headaches
  - Neck pain or strain in the back of the neck
  - Chest pain and tightness
  - · Pain in the upper back, especially the shoulders
  - Difficulty sitting, reading, watching television, or driving for long periods of time
  - Restricted range of motion in the neck or shoulders
  - Numbness, tingling, and pain in the upper arms



#### Lower cross syndrome

- ► Tight muscles hip flexors and thoracolumbar extensors
- Weak muscles abdominal muscles and the gluteus maximus
- Symptoms
  - Reduced mobility or stiffness in lumbar, hip, hamstring, or pelvic region
  - Pain in hip flexors, groin, spine, or buttock muscles
  - Protruding stomach from an overly arched low back
  - Tension in the lower back and/or buttock muscles



## Study 1: The Association Between Neck Pain and Pulmonary Function: A Systematic Review

Amir Hossein Kahlaee 1, Leila Ghamkhar, Amir Massoud Arab

American Journal of Physical Medicine and Rehabilitation. 2017 Mar

#### Abstract

The aim of this study was to systematically review the evidence on respiratory function changes in patients with chronic neck pain. MEDLINE, Elsevier, ProQuest, PubMed, Scopus, Springer, and Google scholar electronic databases were explored thorough December 2015. English-language studies investigating cervical musculoskeletal and respiratory parameters in patients with chronic neck pain were included. Characteristics of the patients, sampling method and size, musculoskeletal and respiratory parameters studied, and appropriateness of the statistical tests were considered. Studies were rated based on study design and performance. Of the 68 studies reviewed, 9 observational studies met our inclusion criteria. Significant difference in maximum inspiratory and expiratory pressures were reported in patients with chronic neck pain compared to asymptomatic subjects. Some of the respiratory volumes were found to be lower in patients with chronic neck pain. Muscle strength and endurance, cervical range of motion, and psychological states were found to be significantly correlated with respiratory parameters. Lower Pco2 in patients and significant relationship between chest expansion and neck pain were also shown. Respiratory retraining was found to be effective in improving some cervical musculoskeletal and respiratory impairment. Functional pulmonary impairments accompany chronic neck pain. Based on the observed association, investigation of the effectiveness of management of CNP on respiratory function is strongly suggested.

# Study 2: Respiratory characteristics of individuals with non-specific low back pain: A cross- sectional study

Vikram Moha, Aatit Paungmali, Patraporn Sitilerpisan, Ummi F Hashim, Munifa B Mazlan, Tuan N Nasuha

Nursing and Health Sciences. 2018 Jun

#### **Abstract**

Non-specific low back pain (NS-LBP) is known to cause respiratory dysfunction. In this study, we investigated alterations in breathing, respiratory strength and endurance, core stability, diaphragm mobility, and chest expansion among patients with NS-LBP and healthy individuals. The specific aim of the study was to correlate between respiratory function and other variables among NS-LBP patients. Thirty four patients with NS-LBP were matched with 34 healthy participants before undergoing total faulty breathing scale, spirometer, respiratory pressure meter, chest expansion, ultrasound, and pressure biofeedback measurements. There were signs of faulty breathing in the NS-LBP patients when compared to the healthy participants. Diaphragmatic mobility and respiratory muscle endurance were lower in the NS-LBP group. Chest expansion exhibited a significant decrease at the level of the fourth intercostal space in the NS-LBP group, but respiratory muscle strength and core stability were not significant between the two groups. Positive correlations were found to be fairly significant regarding respiratory muscle strength. The findings of this study indicated altered respiratory characteristics in the NS-LBP patients, and suggested that they would improve through respiratory exercises.

# Study 3: The effect of inspiratory muscles fatigue on postural control in people with and without recurrent low back pain

Lotte Janssens 1, Simon Brumagne, Kathelijn Polspoel, Thierry Troosters, Alison McConnell

Spine (Phila Pa 1976). 2010 May

**Objective:** To determine postural stability and proprioceptive postural control strategies of healthy subjects and subjects with recurrent low back pain (LBP) during acute inspiratory muscles fatigue (IMF).

**Summary of background data:** People with LBP use a more rigid proprioceptive postural control strategy than control subjects during postural perturbations. Recent evidence suggests that respiratory movements create postural instability in people with LBP. The role of the respiratory muscles in postural control strategies is unknown, but can be studied by inducing acute IMF.

**Methods:** Postural control was evaluated in 16 people with LBP and 12 healthy controls, both before and after IMF. Center of pressure displacement was determined on a force plate to evaluate postural stability. Proprioceptive postural control strategies were examined during vibration of the triceps surae muscles or lumbar paraspinal muscles, while standing on both a stable and unstable support surface and without vision. Proprioceptive postural control strategies were determined by examining the ratio of mean center of pressure displacement measured during triceps surae muscles vibration to that measured during lumbar paraspinal muscles vibration. RESULTS.: After IMF, control subjects showed a significantly larger sway compared to the unfatigued condition while standing on an unstable support surface (P < 0.05). IMF induced an increased reliance on proprioceptive signals from the ankles, which resembled the postural control strategy used by people with LBP (P < 0.05). Subjects with LBP showed that same ankle steered postural control strategy in the unfatigued and IMF states (P > 0.05).

**Conclusion:** After IMF, control subjects use a rigid proprioceptive postural control strategy, rather than the normal "multisegmental" control, which is similar to people with LBP. This results in decreased postural stability. These results suggest that IMF might be a factor in the high recurrence rate of LBP.

# Study 4: The presence of respiratory disorders in individuals with low back pain: A systematic review

Nele Beeckmans 1, Astrid Vermeersch 2, Roeland Lysens 3, Peter Van Wambeke 4, Nina Goossens 5, Tinne Thys 6, Simon Brumagne 7, Lotte Janssens

Manual Therapy. 2016 Dec

**Background:** Inspiratory muscles, such as the diaphragm, play a key role in both respiration and spinal control. Therefore, diaphragm dysfunctions are often related to low back pain (LBP). However, few is known on the association between the presence of LBP and the presence of respiratory disorders (RD).

**Objectives:** To perform a systematic review on the relation between RD and LBP.

**Methods:** Two reviewers searched on PubMed/MEDLINE for studies concerning LBP and RD, from 1950 up to January 2016. The search string consisted of the following key words: low back pain, dyspnea, respiratory problems, lung diseases, comorbidity, pulmonary disease, chronic obstructive, smoking, asthma, allergy, sinusitis, respiratory tract infection and hyperventilation. The aim was to evaluate a potential correlation, co-occurrence or causality between RD and LBP.

Results: A total of 16 articles were included. A significant correlation between the presence of LBP and the presence of RD such as dyspnea, asthma, different forms of allergy, and respiratory infections was found. No correlation was found between Chronic Obstructive Pulmonary Disease (COPD) and LBP, and no articles were found on the correlation between hyperventilation and LBP.

**Conclusions:** This is the first study providing an overview of the literature on the relation between LBP and RD. Immunological, biomechanical, psychosocial and socio-economic factors might explain this correlation. Smoking is likely to contribute. Future studies must reveal the causative relationship.

## Study 5: Respiratory dysfunction in patients with chronic neck pain: What is the current evidence?

Dimitriadis, Z., Kapreli, E., Strimpakos, N., and Oldham, J.

Joutnal of Bodywork and Movement Therapies. 2016

**Conclusion:** Drug use to manage pain can reduce respiratory drive, while on the other hand, noxious stimuli can increase respiration and alter rib cage mechanics. Both these changes lead to dysfunctional breathing patterns that can alter blood chemistry and result in hypocapnia (low carbon dioxide levels). This is often seen in patients with chronic neck pain.

See Figure 1.

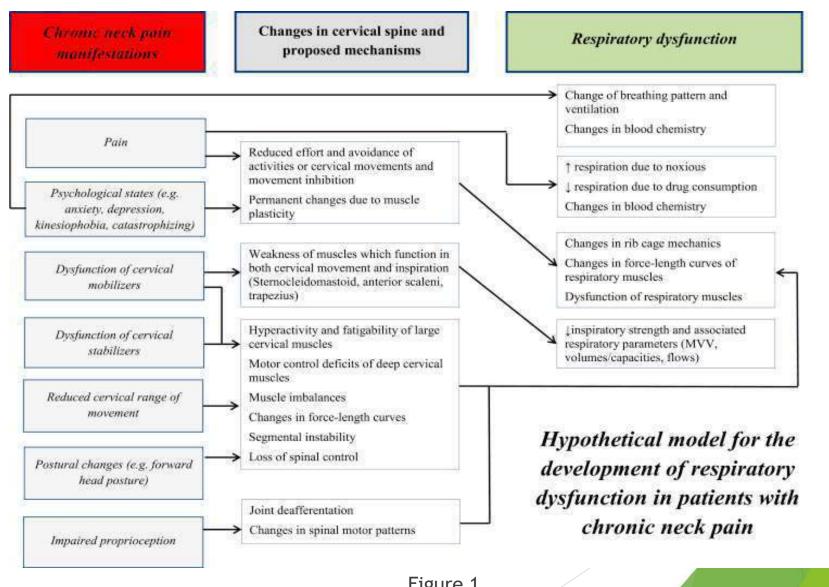


Figure 1

### Links to the studies

- 1. The Association Between Neck Pain and Pulmonary Function: A Systematic Review <a href="https://pubmed.ncbi.nlm.nih.gov/27610549/">https://pubmed.ncbi.nlm.nih.gov/27610549/</a>
- Respiratory characteristics of individuals with non-specific low back pain: A cross-sectional study https://pubmed.ncbi.nlm.nih.gov/29421851/
- Respiratory characteristics of individuals with non-specific low back pain: A cross-sectional study https://pubmed.ncbi.nlm.nih.gov/20393397/
- The presence of respiratory disorders in individuals with low back pain: A systematic review <a href="https://pubmed.ncbi.nlm.nih.gov/27501326/">https://pubmed.ncbi.nlm.nih.gov/27501326/</a>
- 5. Respiratory dysfunction in patients with chronic neck pain: What is the current evidence?
  - https://pubmed.ncbi.nlm.nih.gov/27814848/

## Section 3

- What we can do in the office?
  - History taking
  - Posture check
  - Adjustments
  - ▶ Breathing re-education exercise



## Reviewing the intake forms

#### **KEY POINTS TO LOOK FOR:**

- Pre-existing respiratory conditions
- History of chronic disease that weakens the immune system
- Allergies
- · Smoker or exposure to secondhand smoke
- Stress level
- Being overweight
- For female patients: pregnant?

#### **OBJECTIVE:**

Rule out causes from other medical condition Refer out when appropriate



#### SYSTEMS REVIEW

Please *circle* any conditions that are *presently* causing you a problem and <u>underline</u> those that have caused you problems in the past.

GENERAL SYMPTOMS	RESPIRATORY	GENITOURINARY
Fever	Chronic cough	Frequent urination
Sweats .	Spitting up philegm	Painful urination
Fainting	Spitting up blood	Blood in urine
Sleep disturbance	Chest pain	Pus in urine
Fatigue	Wheezing	Kidney infection
Nervousness	Difficulty breathing	Prostate trouble
Weightloss	Asthma	Uncontrollable urine flow
Weightgain		
NEUROLOGICAL	SARDIOVASCULAR	GASTROINTESTINAL
Visua I disturbances	Rapid beating heart	Poor appetite
Dizziness	Slow beating heart	Difficult digestion
Fa inti ng	High blood pressure	Heartburn
Convulsions	Low blood pressure	Ulicers
Heada che	Pain over heart	Na us ea
Numbness	Hardening of arteries	Vomiting
Neuralgia (nerve pain)	Swollen ankles	Constipation
Poor coordination	Poor circulation	Diarrhea
Weakness	Palpitations	Bloodinstool
	Cold hands or feet	Gallbladder/jaundice
C10147900	Varicos e veins	Colitis
EENT	MUSCLE & JOINT	FOR WOMEN ONLY
Eye pain	Neck pain	Painful menstruation
Double vision	Low back pain	Hot flashes
Ringing in ears	Arm pain	Irregularcycle
Deafness	Shoulder pain	Cramps or back pain
Nos ebleeds	Leg pain	Vaginal discharge
Trouble swallowing	Knee pain	Ni ppl e dis charge
Hoarseness	Foot pain	Lumps in breast
Sinus Infection	Pain/numbness down arms or legs	Menopausal symptoms
Nas al dra in age	Pain between shoulders	Birth control pills
En larged glands	Swollen joints	Miscarriages
	Spinalcurvature	Complications with pregnancy
	Arthritis	Pregnant? Y/N Week? Other:
12	Fractures	4 8 8

#### PAST MEDICAL HISTORY What illnesses and conditions are you currently under treatment for or have been in the past? (eg. Heart disease, diabetes, blood pressure) Asthma Diabetes High Blood Pressure Cancer Kidney Trouble Heart Trouble Blood Disease Lung Sickle Cell Anemia Liver Trouble Psychiatric Disease Other REVIEW OF SYSTEMS: Please circle any health problems in the following areas. HEART Shortness of Breath HEENT Other Coronary Artery Blurry Vision GENITALS / Other ENDOCRINE Hearing Loss Disease BREAST Thyroid Disease Pain with Swallowing Hypertension Tumor Erectile Dysfunction Large High Cholesterol Diabetes Other Heart Murmur Excessive Weight URINARY Prostate Menopause Breast Heart Failure Burning Loss Excessive Weight Heart Attack Blood in Urine Cancer Other complaints: Other Gain Frequency MUSCULOSKELE Other GENERAL Other TAL SKIN Cancer Osteoarthritis NEURO Rash Psoriasis Fever Osteoporosis Numbness Lesions Moles Night sweats Chronic Muscle Pain Seizure Disorder Other TB Tremors Stroke Swollen Joints GASTROINTESTI Chills RA Other NAL Other Fibromyalgia Reflux Peptic Ulcer VASCULAR Hepatitis Gallstones Other Phlebitis RESPIRATORY Clotting / Bleeding Other Is there any chance that you may be Asthma Easy Bruising PSYCHIATRIC Emphysema Anxiety Depression pregnant? Yes No Anemia

Schizophrenia ADHD

N/A

Sleep Apnea

Other

				HEALTH H						
Ø		e indicat		ent/ongoing (C/O)	and past					
	C/O	Past	400-971-00-7	ratory/Lungs	C/O	Past	Digest	2 (2)	C/O	Past
Whiplash			Asthm				7.0	pation		
Headaches			Broncl	nitis			Diarrh	1700		
Migraine		7	10000000000000000000000000000000000000	/sema				's Disease		
Concussion		$\Box$	Pneun	nonia			Irritab	le Bowel Syndron	ne□	
Ringing in the Ears		080080	Shortn	ess of Breath			Ulcers			
Hearing Loss		$\Box$	Sinusit	tis			Divert	iculitis		
Vision Problems		4	Freque	ent Colds			Nause	a		
Brain Injury			Recuri	ent Lung Infecti	on 🗆					
TMJ (Jaw Pain)			Chron	ic Cough						
Other:		- 133		History of Abov			Other			
			Other:			$-\!\!/\!\!-$				
Cardiana and a		6.10	B	No Cont		6/0	W-22	To Constitute	C/O	
Cardiovascular	,	<u>c/o</u> □	Past	Nervous Syst		<u>c/o</u> □	Past	Infections Hepatitis	<u>C/O</u>	Past
High Blood Pressure				Spinal Cord In				1.5		
Low Blood Pressure/				Numbness/Ti	11. 10011111111111111111111111111111111			Type:		
Heart Attack	. 6. 0.			Sensory Chang	ge/Loss			Infectious Skin		
Chronic Congestive Heart	t Failure			Sciatica				Conditions		
Chest Pain/Angina				TOS				TB		
Stroke	0000000			Seizures	7000000			HIV		Ш
Pace Maker or Similar De	vice			Multiple Scler						
Phlebitis				Cerebral Palsy	7					
Hemophilia				Epilepsy						
Heart Disease				Carpal Tunnel						
Poor Circulation				Muscular Dyst	trophy					
Congestive Heart Failure Family History of Above:										
Other:				Other:				Other:		

## Reviews the symptom list

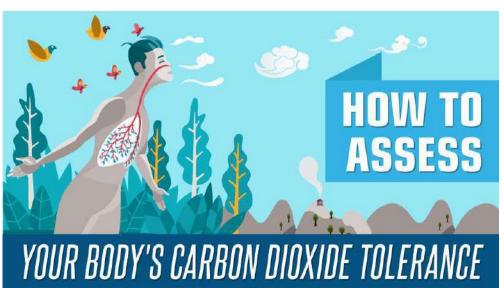
Concepts	Observable Symptoms
Breathing problems	<ul><li>Wheezing</li><li>Rapid or shallow breathing</li><li>Loud, noisy breathing</li></ul>
Cough	<ul><li>Daytime cough</li><li>Nighttime cough</li></ul>
Fever	• Fever
Congestion	<ul><li>Nasal discharge/runny nose</li><li>Nasal congestion/stuffy nose</li></ul>
Symptom impacts	<ul><li>Activity</li><li>Appetite</li><li>Disposition</li><li>Sleep</li></ul>

In addition: chest pain, chest tightness, fatigue

## After ruling out other medical conditions

#### Objective findings

- ▶ Check breathing rate normal for adult at rest 12-16 breaths per minute
- Assess body's carbon dioxide tolerance
- Posture check
  - ▶ Wall test
  - Mirror test



Breathe quietly To begin, sit in and then out straight (shoulders back, of your nose. legs uncrossed) Then after an and breathe in a exhale, pinch steady, your nose shut comfortable with your fingers. rhythm.

03

Keep track of how many seconds you can hold your breath before feeling a strong urge to breathe again.





Note your time.

#### 1-10 seconds

This is a serious breathing impairment.

#### 10-20 seconds

This is a significant breathing impairment.

#### 20-40 seconds

This is a mild breathing impairment.

#### 40-60 seconds

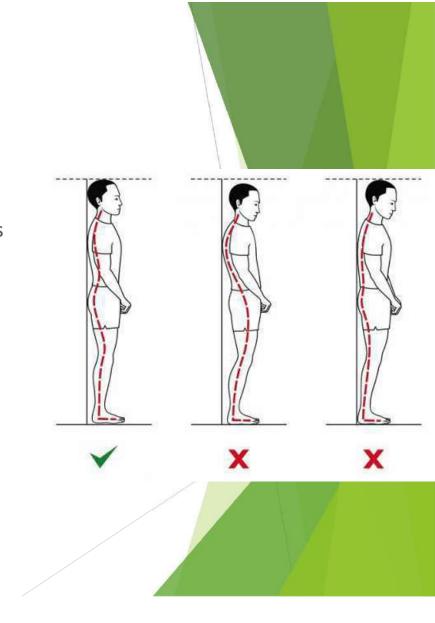
This is a healthy breathing pattern that is in peak condition.

## CO2 tolerance result interpretation

- ► 1-10 seconds The Buteyko method considers this a serious breathing impairment. You might experience difficulties while exercising and have some chronic health problems. Tips: Begin strengthening your carbon dioxide and breathing tolerance by breathing only through your nose throughout the day.
- ▶ 10-20 seconds This is a significant breathing impairment. You will likely experience moderate difficulties while exercising. Tips: Only breathe through your nose during exercise. Scale back on exercises that force you to cope by breathing through your mouth.
- ▶ 20-40 seconds This is a mild breathing impairment and an average level for most adults. Tips: To increase your CP at this point, you need to engage in physical exercise and cardio, such as jogging, cycling, or swimming, which build up an air shortage.
- ▶ 40-60 seconds This is a healthy breathing pattern that is in peak condition and is unlikely to experience difficulties or get winded quickly while exercising. Tips: Increase your quality of life and mental energies through meditation and mental training and development.

## Wall test

- Patient stands with the back of the head touching the wall and heels six inches from the baseboard. With the buttocks touching the wall, check the distance with between the lower back and the wall, and the neck and the wall.
- Good posture If you can get within an inch or two at the low back and two inches at the neck

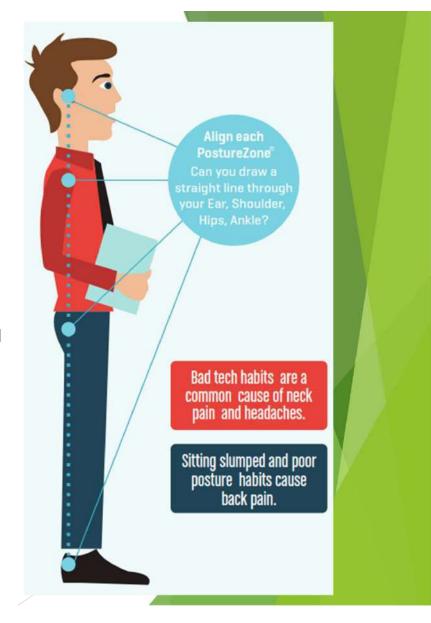


## Mirror test

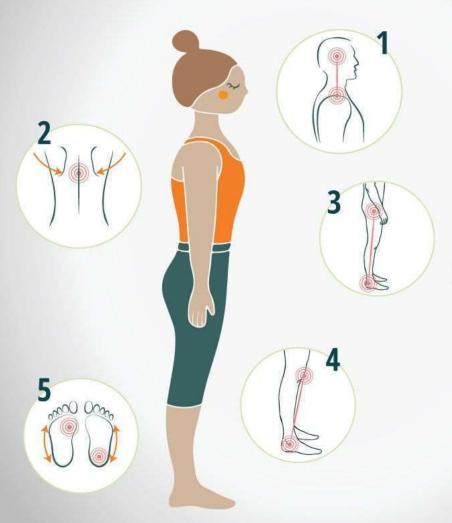
- Stand facing a full-length mirror and check to see if:
  - Level shoulders
  - 2. Head is straight
  - 3. The spaces between your arms and sides seem equal
  - 4. Hips are level, your kneecaps face straight ahead
  - 5. Ankles are straight.



- Side View. Check for the following:
  - 1. Head is erect, not slumping forward or backwards
  - 2. Chin is parallel to the floor, not tilting up or down
  - 3. Shoulders are in line with ears, not drooping forward or pulled back
  - 4. Stomach is flat
  - 5. Knees are straight
  - 6. Lower back has a slightly forward curve (not too flat or not curved too much forward, creating a hollow back).



### **CHECK YOUR POSTURE**



#### 1. HEAD

Your ears should line up above your shoulders. Don't lean your head forward to look at your device or computer screen. Adjust your work area so that you are looking straight ahead comfortably.

#### 2. SHOULDERS

Stand straight and tall. Your shoulder blades should "melt" down your back and allow for the natural curve of your thoracic or upper spine.

#### 3. HIPS

Keep your hips positioned over your heels. Allow for the natural curve at the small of your back and be careful not to tilt your pelvis forward as this places undue strain on the muscles of your lower back.

#### 4. KNEES

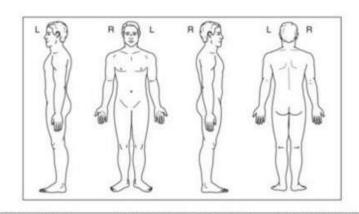
Knees should be positioned over the ankles and slightly bent, rather than locked.

#### 5. FEET

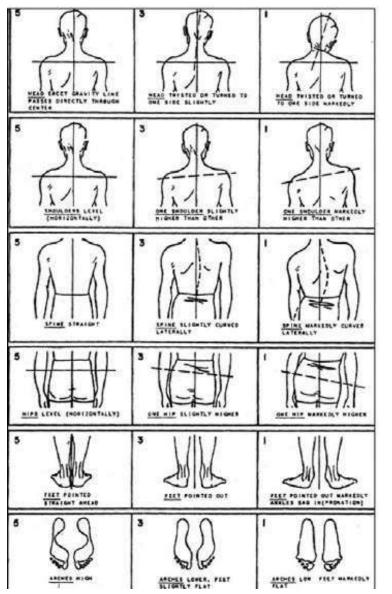
Both feet should be parallel and planted on the ground whether standing or sitting. Distribute your weight evenly between the balls of your feet and your heels.

©CANADIAN CHIROPRACTIC ASSOCIATION

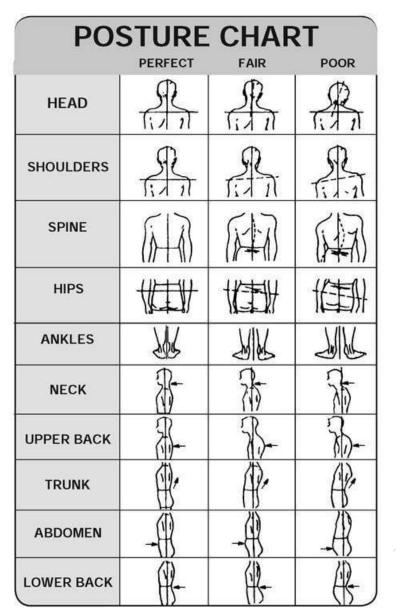
## To add to your charts...



OBSERVATION & PALPATION	<b>OBSERVATION &amp; PALPATION</b>	GAIT ASSESSMENT
ALIGNMENT	RIBS	×
Chin in line with nose, stemal notch, navel	Even	HEAD
Other:	Springy	Remains steady/eyes forward
HEAD	Other:	Other:
Tilted ( L )	ABDOMEN	TRUNK
Tilted (R)	Firm and pliable	Remains vertical
Rotated ( L )	Hard areas	Other:
Rotated (R)	Other:	SHOULDERS
EYES	WAIST	Remain level
Level	Level	Rotate during walking
Equally set in sockets	Other:	Other:
Other:	SPINE CURVES	ARMS
EARS	Normal	Motion is opposite leg swing
evel	Other:	Motion is even (L) and (R)
Other:	GLUTEAL MUSCLE MASS	Other:
SHOULDERS	Even	( L ) swings freely
Level	Other:	( R ) swings freely
(R) high / (L) low	ILIAC CREST	Other:
(L) high / (R) low	Level	HIPS
L) rounded forward	Other:	Remain level
(R) rounded forward	KNEES	Other:
Muscle development even	Even/symmetrical	Rotate during walking
Other:	Other:	Other:









## Review: Poor posture

#### **Symptoms:**

- Anterior head carriage
- Rounded shoulders
- Potbelly
- Bent knees when standing or walking
- Shallow or improper breathing pattern
- Back pain
- Body aches and pains
- Muscle fatigue
- Headache

#### **History/Risk Factors:**

- Prolonged sitting
- Sedentary lifestyle
- Joint stiffness
- Muscle tightness
- Poor core stability
- Poor ergonomic work stations
- Scoliosis



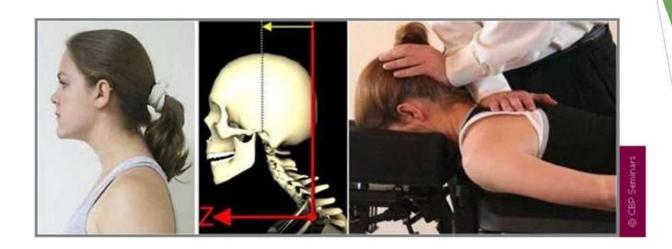
### **Treatment**

- Postural chiropractic (the structural approach)
  - ► focuses on structural correction of the spine the underlying foundation of the spine
  - ▶ The Pettibon System
    - ▶ Burl Pettibon, D.C., FACBS, FRCCM, PhD
  - ► Chiropractic Biophysics (CBP) Mirror Image® Posture adjustment
    - ▶ Donald Harrison, D.C.
    - ► Mirror Image® Posture exercise
    - ▶ Mirror Image® Postural and spinal traction





Mirror Image exercise example for the abnormal forward head posture. The patient has an abnormal forward head (translation) posture and the skeletal animation shows what happens to the spine with this posture. On the right is two different CBP® Mirror Image exercises: one with just the patient's muscles and body as resistance and the other with an elastic band for increased contraction effort. The patient actively maneuvers their posture into the opposite or Mirror Image position.



Mirror Image adjustment example for the head posture. The patient has forward head posture (translation) and the skeletal animation shows what happens to the spine with this posture. On the right is the CBP Mirror Image adjustment. The posture is placed in its opposite position and then a Chiropractic adjustment is performed.

## Treatment cont.

- Work on the muscles
  - Upper body
    - ► Release the tight
      - Scalenes
      - ▶ SCM
      - Pectoralis major and minor
      - ▶ Levator scapulae
      - Upper trapezius

- ▶ Strengthen the weak
  - ▶ Rhomboid major and minor
  - Serratus anterior
  - ▶ Lower and middle trapezius



#### Lower body

- ▶ Release the tight
  - ► Hip flexors (iliacus, psoas major, rectus femoris)
  - ► Thoracolumbar extensors (erector spinae, multifidus, quadratus lumborum and latissimus dorsi)

- ▶ Strengthen the weak
  - Abdominal muscles (external obliques, internal obliques, rectus abdominis, transversus abdominis)
  - ▶ Gluteus maximus



## Suggestions for patients to improve posture and breathing

- Take a break.
  - A small amount of movement frequently through the day can help reset our postural muscles and burn off the adrenalin dumping into our bloodstream when stressed.
- Change phone.
  - The type of phone you use affects the level of postural stress. Bigger, easier to read phones with better ergonomics might help.
- Dump the phone and have a technology holiday.
  - A bit drastic, but what's more important, Facebook or your health? Why not start with one day a week that is technology free.
- Do yoga, Pilates, or some form of stretching.
  - Exercises like the downward dog, cat-cow, and chin tuck are great for stretching those tight shoulders, upper back, and neck muscles that get over worked (just like Cinderella) when stressed.

#### Good Ergonomics.

 Computers have the potential to improve our posture if used correctly. Standing desks and ergonomics go a long way towards not only fixing postural issues but improving concentration, reducing fatigue, and creating a more creative environment for learning.

#### Find neutral.

 Good posture isn't about standing bolt upright and having shoulders pinned back. It is about finding neutral position of our spine and limbs making it easier to adopt a joy, belly breathing technique. Set an alarm every 30 minutes when at the computer or sitting to reset your posture. Practice makes perfect.

#### Perform breathing techniques.

 Not only will controlled conscious breathing exercises help activate the diaphragm, the physiological and mental responses to proper breathing helps reduce stress, anxiety, and depression. When feeling stressed, focus on the exhale. Remember without fail, exhale.

## Breathing Re-education Exercises

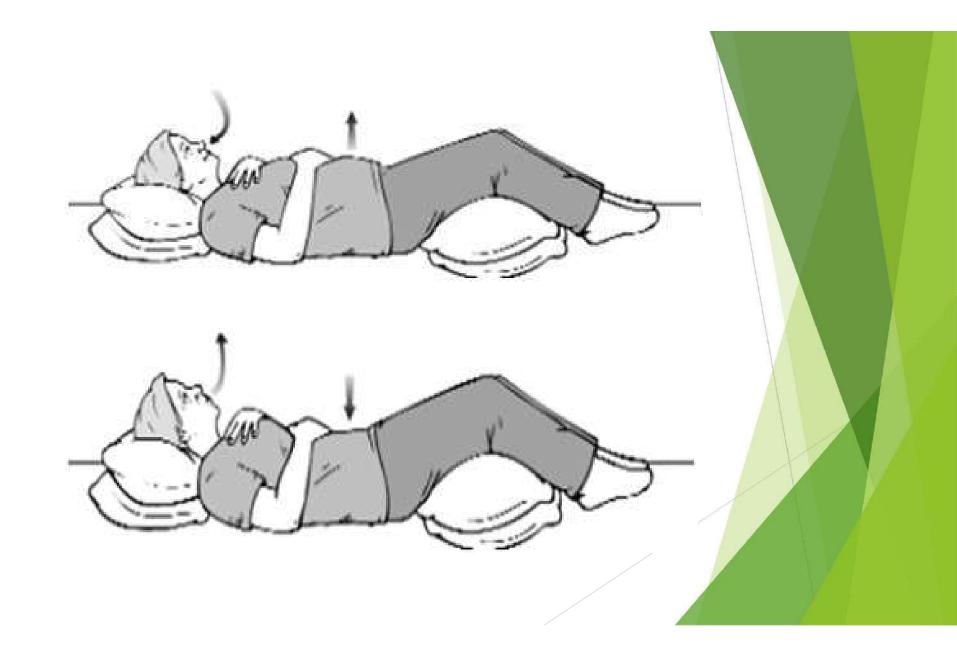
- Diaphragmatic Breathing
- Pursed-lip Breathing
- ▶ The 365 breathing method
- ► The 4-7-8 breathing exercise
- Ayurvedic and Pranayama breathing techniques
- Box breathing
- Buteyko breathing methods
- Qi breathing



#### Diaphragmatic Breathing

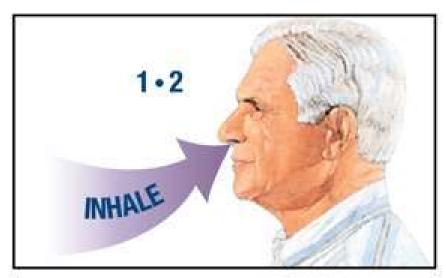
- 1. Relax your shoulders and sit back or lie down.
- 2. Place one hand on upper chest and the other on the belly, just below the rib cage
- 3. Inhale slowly through your nose for two seconds, feeling the air move into your abdomen and feeling your stomach move out. The hand on your chest should remain still while the other on should rist.
- 4. Tighten the abdominal muscles and let them fall inward as you exhale through pursed lips. The hand on the belly should move down to its original position.
- 5. Repeat.

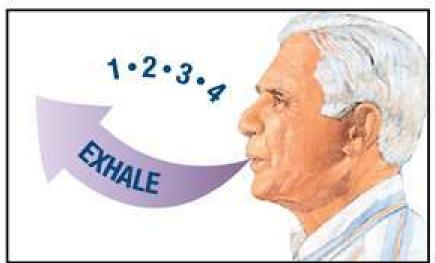
Practice for five to 10 minutes, several times a day if possible.



#### Pursed-lip Breathing

- ► can slow down your breathing, reducing the work of breathing by keeping your airways open longer. This makes it easier for the lungs to function and improves the exchange of oxygen and carbon dioxide.
- 1. Inhale slowly through your nostrils.
- 2. Purse your lips, as if pouting or about to blow on something.
- 3. Breathe out as slowly as possible through pursed lips. This should take at **least twice** as long as it did to breathe in.
- 4. Repeat.





#### 365 Breathing Method

- ▶ Utilize cardiac coherence uses biofeedback to coordinate your breath and heart rate
- Diaphragmatic
- ▶ Breathe at a constant rhythm of 6 cycles/min for 5 mins.
- Practice at least 3x/day

## THE 365 BREATHING METHOD

## **BEST FOR:**



Chronic stress



Phobias



Nicotine Withdrawal Symptoms



Anxiety



Pain Management



Trauma Therapy



Utilizes cardiac coherence



Practiced every day three times per day



Six cycles per minute of five seconds of inhaling and five seconds of exhaling



Stimulates vagus nerve to create calm



Each session requires five minutes

#### ► 4-7-8 Breathing Exercise

- ▶ Dr. Andrew Weil
- ► Exhaling twice for each time that you inhale longer exhalation stimulates parasympathetic nervous system
  - 1. Sit up straight and relax the tip of your tongue against the back of the front teeth.
  - 2. Using only the nose, breath in for 4 counts.
  - 3. Hold the breath for 7 counts.
  - 4. Exhale through the mouth for 8 counts, making a whooshing sound through the mouth as you breathe out.
  - 5. Repeat this breathing cycle a total of four times.



# THE 4-7-8 BREATHING EXERCISE

# **BEST FOR:**



Relaxation



**Managing Cravings** 



Improved Sleep



Reducing Anger Responses



Can be used to relax throughout the day



Allows the body to relax



Best used before bed



Exhale for twice as long as your inhalation

#### Ayurvedic and Pranayama Breathing Techniques

- Yogic breathing
- ► Nasal and Diaphragmatic
- Ayurvedic warm up exercises
  - Alternate Nostril Breathing Use your right thumb to close your right nostril. Breath in through the left nostril. Then, close the left nostril and breathe out through the right nostril. Reverse the process, breathing in through your right nostril and out through your left. Continue this cycle until you feel that you feel focused and relaxed, or for 5 minutes, whichever comes first.
  - Uninostril Close one of your nostrils. Then, inhale and exhale exclusively through the open nostril. Try to keep your breathing slow and evenly paced.
  - **Right Nostril Initiated** Close the left nostril and inhale through the right nostril. Then close the right nostril and exhale through the left. Repeat this process as desired for mental focus.
  - Psychic Breath Inhale and exhale through the nose at a steady, comfortable pace. As you do so, partially contract the glottis (the area at the back of your throat). Your breath may sound like light snoring. Remain aware of the breath as it passes through your throat.
  - Female Honeybee Humming Breath Fully inhale. Then, use your index fingers to close your ears. Exhale while making a soft humming sound, like a honeybee.

# AYURVEDIC AND PRANAYAMA BREATHING TECHNIQUES

## **BEST FOR:**



Mindfulness Meditation



Good Health



Focus



Yogic Exercises



Prioritizes awareness



Otherwise known as yogic breathing



Great for pairing with yoga



Uses a variety of warm-ups



Supports spiritual practices, personal development, and healing

Uses four primary skills:



Nose breathing



Focus



Diaphragm breathing



Diaphragm strengthening

#### Box Breathing

- ► Nasal and diaphragmatic
- ▶ Helps regulate involuntary bodily functions, such as body temperature
  - 1. Inhale for a 5-second count.
  - 2. Hold the breath in for another 5 seconds.
  - 3. Exhale for 5 seconds.
  - 4. Hold the breath from another 5-second count.
  - 5. Repeat.



# **BOX BREATHING**

## **BEST FOR:**



Focus and Deliberation



Physical Training



Quitting Smoking



Used to aid slow, calm deliberation



Also used for respiratory strengthening



Calms the nerves



Helps to regulate the body



Inhale for a count of 5, hold for 5, exhale for 5, and hold for 5. Build up to 5-10 minutes per day.

#### Buteyko Breathing Methods

- ▶ Developed in Russia as asthma treatment
- ▶ Helps reverse effects of improper breathing
- ▶ Positive physical effects can include increased body temperature or less commonly, temperature stability in extreme environments which is a signal of better blood circulation.

# **BUTEYKO BREATHING METHODS**

## **BEST FOR:**



Physical Health



Controlling Anxiety and Panic Attacks



Decreasing Effects of Asthma



Exercise Training



Promoting Good Sleep



Decreasing Effects of Sleep Apnea



Developed in Russia as an asthma treatment



Increases physical temperature



Seeks to reverse effects or poor breathing techniques



Aim to slow down your breathing to 6 counts per minute, breathing into your belly

#### Qi Breathing

- ▶ A meditative deep breathing technique
  - 1. State your intention for your breathing session. For example, you might want to find energy and motivation, or you might want focus and relaxation.
  - 2. Inhale and exhale deeply and quickly through the nose in one-second bursts. Imagine your breath moving in a circle through your body, as it flows up the back of the spine and then down the front.
  - 3. Incorporate a rocking movement with the breathing by rocking forward to your knees on the exhalation and the backward on the inhalation. Focus primarily on the inhalation and the ability to draw in energy.
  - 4. Maintain your focus in your breath and keep a quiet mind.

# **QI BREATHING**

# **BEST FOR:**



Increased Motivation



Energy



Health



Inhale and exhale deeply and quickly through the nose in one-second bursts



A meditative deep breathing technique



Focuses the mind to channel motivation



Can take 3-30 minutes



Brings peace or an energetic bliss



Developed from traditional Chinese philosophy



Breathing from

the Diaphragm



"Deep

Breathing"





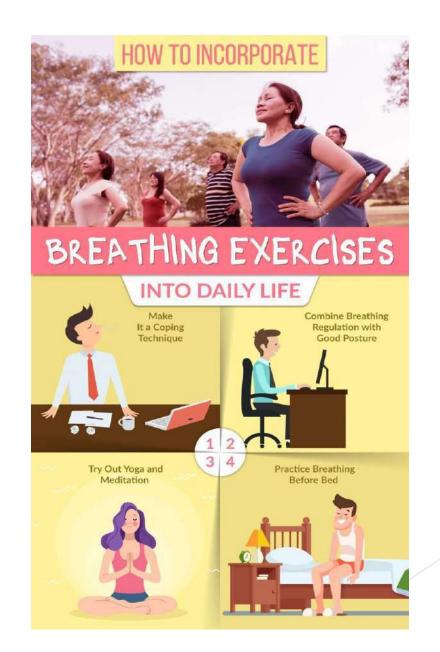




Ways

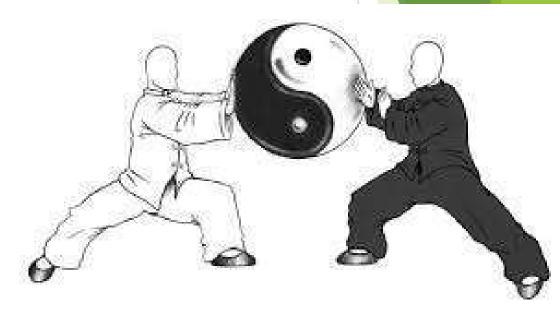
# Incorporating breathing exercises into daily life

- Make it a coping technique
  - Make a firm and structured coping technique or routine this adds structure and something rote and memorized that you can fall back on for comfort, as well as mental and physical renewal
- Combine breathing regulation with good posture
- Try out yoga and meditation
- Practice breathing before bed
  - ▶ 20 minutes of slow breathing exercises before bed can significantly improve sleep.
  - ▶ Short version 3 minutes of the 4-7-8 breathing pattern can work wonders for slowing the heart rate and relaxing the mind and body before bed.



# Explore Benefits of Tai Chi

- An ancient Chinese tradition based in martial arts that is now a popular lowimpact exercise method involving slow movements and breath.
- "Meditation in motion"
- Belief systems
  - ▶ Qi an energy force thought to flow through the body; tai chi is said to unblock and encourage the proper flow of qi.
  - ▶ Yin and yang opposing elements thought to make up the universe that need to be kept in harmony. Tai chi is said to promote this balance.



#### Possible Benefits

- Decreased stress, anxiety and depression
- Improved mood
- Improved aerobic capacity
- Increased energy and stamina
- ▶ Improved flexibility, balance and agility
- Improved muscle strength and definition

- ► Enhance quality of sleep
- ► Enhance the immune system
- ▶ Help lower blood pressure
- Improve joint pain
- Improve symptoms of congestive heart failure
- Improve overall well-being
- Reduce risk of falls in older adults

# Study 1: Tai Chi and Pulmonary Rehabilitation Compared for Treatment-Naïve Patients with COPD: A Randomized Controlled Trail

Michael I Polkey, Zhi-Hui Qiu, Lian Zhou, Meng-Duo Zhu, Ying-Xin Wu, Yong-Yi Chen, Sheng-Peng Ye, Yu-Shan He, Mei Jiang, Bai-Ting He, Bhavin Mehta, Nan-Shan Zhong, Yuan-Ming Luo Chest. May 2018.

#### **Abstract**

**Background:** In COPD, functional status is improved by pulmonary rehabilitation (PR) but requires specific facilities. Tai Chi, which combines psychological treatment and physical exercise and requires no special equipment, is widely practiced in China and is becoming increasingly popular in the rest of the world. We hypothesized that Tai Chi is equivalent (ie, difference less than ±4 St. George's Respiratory Questionnaire [SGRQ] points) to PR.

**Methods:** A total of 120 patients (mean FEV<sub>1</sub>, 1.11  $\pm$  0.42 L; 43.6% predicted) bronchodilator-naive patients were studied. Two weeks after starting indacaterol 150  $\mu$ g once daily, they randomly received either standard PR thrice weekly or group Tai Chi five times weekly, for 12 weeks. The primary end point was change in SGRQ prior to and following the exercise intervention; measurements were also made 12 weeks after the end of the intervention.

**Results:** The between-group difference for SGRQ at the end of the exercise interventions was -0.48 (95% CI PR vs Tai Chi, -3.6 to 2.6; P = .76), excluding a difference exceeding the minimal clinically important difference. Twelve weeks later, the between-group difference for SGRQ was 4.5 (95% CI, 1.9 to 7.0; P < .001), favoring Tai Chi. Similar trends were observed for 6-min walk distance; no change in FEV<sub>1</sub> was observed.

Conclusions: Tai Chi is equivalent to PR for improving SGRQ in COPD. Twelve weeks after exercise cessation, a clinically significant difference in SGRQ emerged favoring Tai Chi. Tai Chi is an appropriate substitute for PR.

# Study 2: Tai Chi Training reduced coupling between respiration and postural control

Matthew L Holmes, Brad Manor, Wan-hsin Hsieh, Kun Hu, Lewis A Lipsitz, Li Li Neuroscience Letters. Jan 2016.

#### Abstract

In order to maintain stable upright stance, the postural control system must account for the continuous perturbations to the body's center-of-mass including those caused by spontaneous respiration. Both aging and disease increase "posturo-respiratory synchronization;" which reflects the degree to which respiration affects postural sway fluctuations over time. Tai Chi training emphasizes the coordination of respiration and bodily movements and may therefore optimize the functional interaction between these two systems. The purpose of the project was to examine the effect of Tai Chi training on the interaction between respiration and postural control in older adults. We hypothesized that Tai Chi training would improve the ability of the postural control system to compensate for respiratory perturbations and thus, reduce posturo-respiratory synchronization. Participants were recruited from supportive housing facilities and randomized to a 12-week Tai Chi intervention (n=28; 86  $\pm$  5 yrs) or educational-control program ( $\tilde{n}$ =34, 85  $\pm$  6 yrs). Standing postural sway and respiration were simultaneously recorded with a force plate and respiratory belt under eyes-open and eyes-closed conditions. Posturo-respiratory synchronization was determined by quantifying the variation of the phase relationship between the dominant oscillatory mode of respiration and corresponding oscillations within postural sway. Groups were similar in age, gender distribution, height, body mass, and intervention compliance. Neither intervention altered average sway speed, sway magnitude or respiratory rate. As compared to the educationcontrol group, however, Tai Chi training reduced posturo-respiratory synchronization when standing with eves open or closed (p<0.001). Tai Chi training did not affect traditional parameters of standing postural control or respiration, yet reduced the coupling between respiration and postural control. The beneficial effects of Tai Chi training may therefore stem in part from optimization of this multi-system interaction.

# Study 3: Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial

Chenchen Wang, Christopher H Schmid, Roger A Fielding, William F Harvey, Kieran F Reid, Lori Lyn Price, Jeffrey B Driban, Robert Kalish, Ramel Rones, Timothy McAlindon BMJ. Mar 2018.

**Objectives:** To determine the effectiveness of tai chi interventions compared with aerobic exercise, a current core standard treatment in patients with fibromyalgia, and to test whether the effectiveness of tai chi depends on its dosage or duration.

Design: Prospective, randomized, 52 week, single blind comparative effectiveness trial.

Setting: Urban tertiary care academic hospital in the United States between March 2012 and September 2016.

**Participants:** 226 adults with fibromyalgia (as defined by the American College of Rheumatology 1990 and 2010 criteria) were included in the intention to treat analyses: 151 were assigned to one of four tai chi groups and 75 to an aerobic exercise group.

Interventions: Participants were randomly assigned to either supervised aerobic exercise (24 weeks, twice weekly) or one of four classic Yang style supervised tai chi interventions (12 or 24 weeks, once or twice weekly). Participants were followed for 52 weeks. Adherence was rigorously encouraged in person and by telephone.

Main outcome measures: The primary outcome was change in the revised fibromyalgia impact questionnaire (FIQR) scores at 24 weeks compared with baseline. Secondary outcomes included changes of scores in patient's global assessment, anxiety, depression, self efficacy, coping strategies, physical functional performance, functional limitation, sleep, and health related quality of life.

Results: FIQR scores improved in all five treatment groups, but the combined tai chi groups improved statistically significantly more than the aerobic exercise group in FIQR scores at 24 weeks (difference between groups=5.5 points, 95% confidence interval 0.6 to 10.4, P=0.03) and several secondary outcomes (patient's global assessment=0.9 points, 0.3 to 1.4, P=0.005; anxiety=1.2 points, 0.3 to 2.1, P=0.006; self efficacy=1.0 points, 0.5 to 1.6, P=0.0004; and coping strategies, 2.6 points, 0.8 to 4.3, P=0.005). Tai chi treatment compared with aerobic exercise administered with the same intensity and duration (24 weeks, twice weekly) had greater benefit (between group difference in FIQR scores=16.2 points, 8.7 to 23.6, P<0.001). The groups who received tai chi for 24 weeks showed greater improvements than those who received it for 12 weeks (difference in FIQR scores=9.6 points, 2.6 to 16.6, P=0.007). There was no significant increase in benefit for groups who received tai chi twice weekly compared with once weekly. Participants attended the tai chi training sessions more often than participants attended aerobic exercise. The effects of tai chi were consistent across all instructors. No serious adverse events related to the interventions were reported.

Conclusion: Tai chi mind-body treatment results in similar or greater improvement in symptoms than aerobic exercise, the current most commonly prescribed non-drug treatment, for a variety of outcomes for patients with fibromyalgia. Longer duration of tai chi showed greater improvement. This mind-body approach may be considered a therapeutic option in the multidisciplinary management of fibromyalgia.

# Study 4: Immediate effects of breathing reeducation on respiratory function and range of motion in chronic neck pain

Orawan Yeampattanaporn, Keerin Mekhora, Wattana Jalayondeja,

Journal of Medical Association of Thailand. 2014 Jul

**Objective:** Neck pain is associated with certain breathing patterns and may lead to altered respiratory function. Moreover the altered breathing patterns may cause neck pain symptoms. This study has determined the effects of respiratory muscle reeducation on neck pain symptoms and respiratory function.

Material and method: Subjects with chronic neck pain (n = 36) were re-educated with three breathing patterns for 30 min. The pain intensity at rest and at the end-of-range of each neck movement, the cervical range of motion (CROM) measured from photographic images and the chest expansion during full inhalation and exhalation recorded using videography were evaluated before and after breathing re-education. Upper trapezius, anterior scalene, and sternocleidomastoid activity were evaluated during normal and deep breathing using surface electromyography, and the respiratory function measured by a spirometer was also evaluated during the same period.

**Results:** The pain intensity and the muscle activity were **significantly decreased** after re-education. The CROM and chest expansion at lower rib cage were **significantly increased** after re-education.

**Conclusion:** Breathing re-education can change breathing patterns and increase chest expansion. This change leads to an improvement in CROM Positive consequences may result from the improvement in diaphragm contraction or reduced activity of accessory muscles.

# Study 5: Effect of Different Head-Neck Postures on the Respiratory Function in Healthy Males

Hamayn Zafar, Ali Albarrati, Ahmad H. Alghadir, Zaheen A. Iqbal

Biomed Research International. 2018 Jul

#### Abstract

Normal respiration is a very intricate function that comprises mechanical as well as nonmechanical components. It is shown to be affected by various factors including age, lifestyle, disease, and change in posture. With the increased use of hand held devices, everyone is prone to poor sitting postures like forward head posture. The purpose of this study was to evaluate the effect of assumed forward head posture and torticollis on the diaphragm muscle strength. A sample of 15 healthy males, aged 18-35 years, was recruited for this study. All subjects performed spirometry to measure the forced expiratory volume in 1 second (FEV<sub>1</sub>), the forced vital capacity (FVC), and FEV<sub>1</sub>/FVC ratio. SNIP was measured during upright sitting, induced forward head posture, and torticollis. Subject's mean age (SD) was 23(6) years. The SNIP score of the subjects during sitting with FHP was lower as compared to that during upright sitting. It decreased significantly during induced right torticollis position. This is the first study exploring the impact of different head and neck positions on respiratory function. Alteration of head and neck positions had an immediate negative impact on respiratory function. Clinicians should be prompted to assess respiratory function when assessing individuals with mal-posture.

Conclusion: Alteration of head and neck positions can have an immediate negative impact on respiratory function.

# Study 6: Inspiratory muscles training affects proprioceptive use and low back pain

Lotte Janssens<sup>1</sup>, Alison K McConnell, Madelon Pijnenburg, Kurt Claeys, Nina Goossens, Roeland Lysens, Thierry Troosters, Simon Brumagne

Medicine and Science in Sports and Exercise. 2015 Jan

**Purpose:** We have shown that individuals with recurrent nonspecific low back pain (LBP) and healthy individuals breathing against an inspiratory load decrease their reliance on back proprioceptive signals in upright standing. Because individuals with LBP show greater susceptibility to diaphragm fatigue, it is reasonable to hypothesize that LBP, diaphragm dysfunction, and proprioceptive use may be interrelated. The purpose of this study was to investigate whether inspiratory muscle training (IMT) affects proprioceptive use during postural control in individuals with LBP.

**Methods:** Twenty-eight individuals with LBP were assigned randomly into a high-intensity IMT group (high IMT) and low-intensity IMT group (low IMT). The use of proprioception in upright standing was evaluated by measuring center of pressure displacement during local muscle vibration (ankle, back, and ankle-back). Secondary outcomes were inspiratory muscle strength, severity of LBP, and disability.

**Results:** After high IMT, individuals showed smaller responses to ankle muscle vibration, larger responses to back muscle vibration, higher inspiratory muscle strength, and reduced LBP severity (P < 0.05). These changes were not seen after low IMT (P > 0.05). No changes in disability were observed in either group (P > 0.05).

Conclusions: After 8 wk of high IMT, individuals with LBP showed an increased reliance on back proprioceptive signals during postural control and improved inspiratory muscle strength and severity of LBP, not seen after low IMT. Hence, IMT may facilitate the proprioceptive involvement of the trunk in postural control in individuals with LBP and thus might be a useful rehabilitation tool for these patients

# Study 7: The Impact of Deep Muscle Training on the Quality of Posture and Breathing

<u>Elżbieta Szczygieł</u>, <u>Jedrzej Blaut</u>, <u>Katarzyna Zielonka-Pycka</u>, <u>Krzysztof Tomaszewski</u>, <u>Joanna Golec</u>, <u>Dorota Czechowska</u>, <u>Agata Masłoń</u>, <u>Edward Golec</u>

Journal of Motor Behavior. Mar-Apr 2018.

#### Abstract

Postural control and breathing are mechanically and neuromuscularly interdependent. Both systems- of spinal stability and respiration- involve the diaphragm, transversus abdominis, intercostal muscles, internal oblique muscles and pelvic floor muscles. The aim of the study was to evaluate the effect of exercises activating deep stabilizer muscles on postural control and quality of breathing movements. Eighteen volunteers  $(25,7\pm3,5)$  were recruited from the general population. All the subjects implemented an exercise program activating deep muscles. Head, pelvic and trunk positions in the sagittal and frontal planes were assessed with the photogrammetric method. Breathing movements were estimated with the respiratory inductive plethysmography. The results indicate that the use of deep muscle training contributed to a significant change in the position of the body in the sagittal plane (p = 0.008) and the increase in the amplitude of breathing (p = 0.001).

**Conclusion:** exercising and activating the deep muscles of the body significantly improved the body's alignment but also increased breathing capacity

## Links to the studies

- Tai chi and pulmonary rehabilitation compared for treatment-naïve patients with COPD: a randomized controlled trial https://pubmed.ncbi.nlm.nih.gov/29625777/
- 2. Tai chi training reduced coupling between respiration and postural control <a href="https://pubmed.ncbi.nlm.nih.gov/26518241/">https://pubmed.ncbi.nlm.nih.gov/26518241/</a>
- 3. Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial <a href="https://pubmed.ncbi.nlm.nih.gov/29563100/">https://pubmed.ncbi.nlm.nih.gov/29563100/</a>
- 4. Immediate effects of breathing re-education on respiratory function and range of motion in chronic neck pain <a href="https://pubmed.ncbi.nlm.nih.gov/25141528/">https://pubmed.ncbi.nlm.nih.gov/25141528/</a>
- 5. Effect of Different Head-Neck Postures on the Respiratory Function in Healthy Males <a href="https://pubmed.ncbi.nlm.nih.gov/30112389/">https://pubmed.ncbi.nlm.nih.gov/30112389/</a>
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- 7. The Impact of Deep Muscle Training on the Quality of Posture and Breathing <a href="https://pubmed.ncbi.nlm.nih.gov/28820662/">https://pubmed.ncbi.nlm.nih.gov/28820662/</a>

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- Health Benefits of Tai Chi https://www.health.harvard.edu/staying-healthy/the-health-benefits-of-tai-chi

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