

# Exercise Considerations for those with a Respiratory Disease (In a Post Covid World)

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According to the World Health Organization (WHO), hundreds of millions of people suffer every day from chronic respiratory diseases. Currently 235 million people have asthma, 64 million people have chronic obstructive pulmonary disease (COPD) while millions have allergic rhinitis and other often-underdiagnosed chronic respiratory diseases. Respiratory diseases do not discriminate and affect people of every race, sex, and age. Some of your clients may suffer from a respiratory disease and you may be an important source for relief. Fitness professionals can effectively work with those who have a respiratory disease providing them with a better quality of life through movement. Moreover, now that the world is living with Covid 19, which originated as a respiratory disease, health/fitness professionals can be a considerable resource for management. As their health and fitness coach, you can provide a positive experience to facilitate an effective path to better health and wellness.

## Breath of Life

- One breathes about 20,000 times per day, and by the time one is 70 years old, he/she will have taken at least 600 million breaths.
- Women and children breathe at a faster rate than men.
- The surface area of the lungs is roughly the same size as a tennis court. If all the alveoli in both lungs were flattened out, they would have a total area of about 525 square feet.
- We lose about 12 oz of water through breathing. In addition to exhaling carbon dioxide, you also exhale water.
- Lungs are the only human organ that can float in water! Each of your lungs contains about 300 million balloon-like structures called alveoli, which replace the carbon-dioxide waste in your blood with oxygen. When these structures are filled with air, they make lungs float.
- Yawning is a result of your body not taking in enough oxygen from the air, which causes a shortage of oxygen in our bodies. The brain senses this shortage of oxygen and sends a message that causes you to take a deep long breath (a yawn).
- Your left lung is smaller than your right (which leaves room for your heart).
- A person at rest usually breathes between 12 to 15 times a minute. Newborns up to 6 weeks breathe between 30 to 60 times per minute.
- The word "Lung" originates from 13th century European language, it means "light" which refers to the weight of the organ when considering its size. (because there is so much air in there, and air is light)

\*Source: Health World Organization

## What Does It Feel Like to Not Breathe?

<https://youtu.be/HgUrCWvxyJo>

### CRD and Epidemiology

- According to the World Health Organization (WHO), hundreds of millions of people suffer every day from chronic respiratory diseases (CRD).
- Currently in the United States, 25 million people have asthma (CDC, 2020)
- 15 million people have chronic obstructive pulmonary disease (CDC, 2021)
- 50 million people have allergic rhinitis and other often-underdiagnosed chronic respiratory diseases. 6th leading cause of chronic illness in the U.S. with an annual cost in excess of \$18 billion. (American College of Allergy, Asthma, & Immunology)
- Chronic Obstructive Pulmonary Disease (COPD) is the 4th Leading Cause of Death in the United States (CDC, 2021)

### CRD Affects Everyone

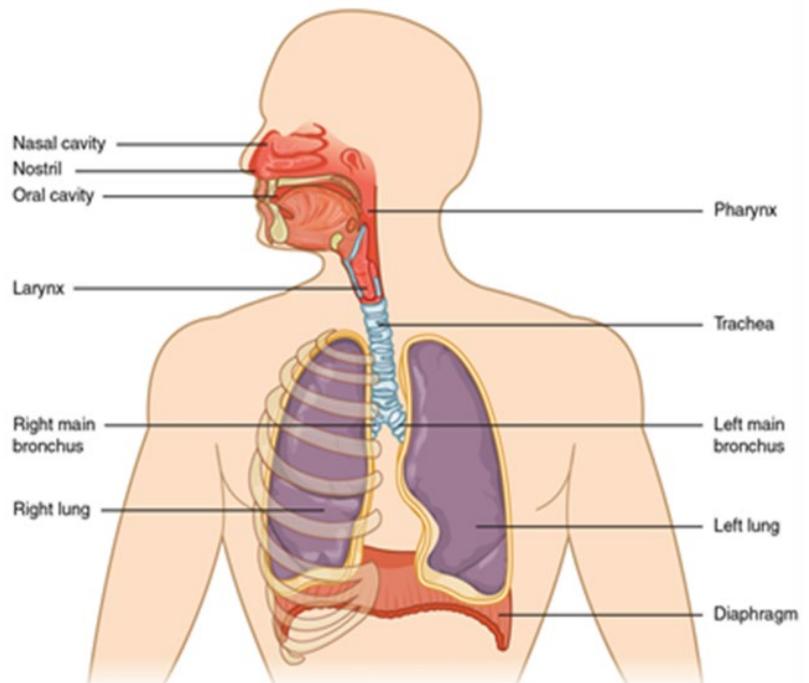
- I'm a Coal Miner's Granddaughter: Grandfather had black lung
- I'm a Mad Scientist's Daughter: Father had chronic bronchitis

### Terms

- Pulmonology: The study of respiratory disease.
- Pulmonologist: A physician who specializes in respiratory disease.
- Other Names
  - chest medicine specialist
  - respiratory medicine specialist
  - respirologist
  - thoracic medicine specialist

### Respiratory Anatomy and Physiology

- Upper Respiratory
  - Nasal Cavity
  - Nostrils
  - Oral Cavity
  - Pharynx
- Lower Respiratory
  - Larynx
  - Trachea
  - Bronchus
  - Lungs
  - Diaphragm



### Conducting Zone

These structures form a continuous passageway for air to move in and out of the lungs.

- Pharynx
- Larynx
- Trachea
- Bronchi
- Bronchioles

## Respiratory Zone

Thin-walled structures found deep inside the lungs that allow inhaled oxygen (O<sub>2</sub>) to diffuse into the lung capillaries in exchange for carbon dioxide (CO<sub>2</sub>).

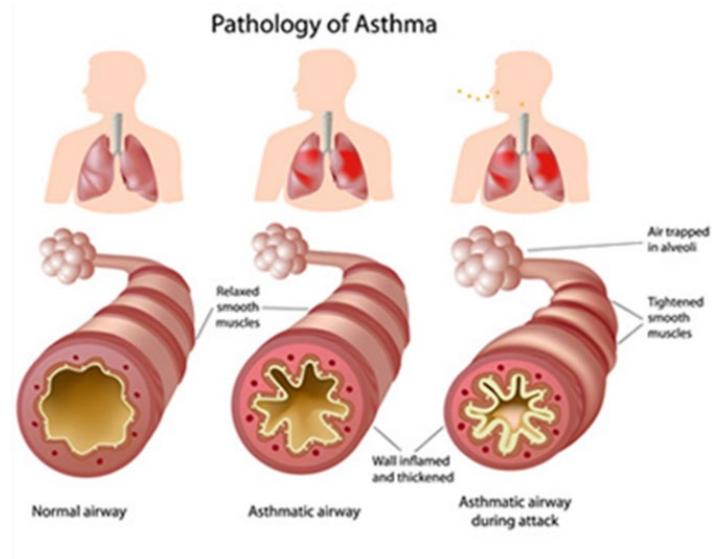
- Bronchioles
- Alveolar Ducts
- Alveoli

## Types of Lung Diseases

- Obstructive: Characterized by airway obstruction which limits the amount of air that is able to enter alveoli because of constriction of the bronchial tree, due to inflammation.
  - Restrictive: Characterized by a loss of lung compliance causing incomplete lung expansion and increased lung stiffness.
  - Chronic Respiratory Disease: long-term diseases of the airways and other structures of the lung. They are characterized by a high inflammatory cell recruitment (neutrophil) and/or destructive cycle of infection
    - Asthma
    - COPD (Chronic Bronchitis and Emphysema)
    - Occupational Lung Disease
- \*Cannot be cured but can lead a better quality of life with management techniques, exercise, and proper nutrition.

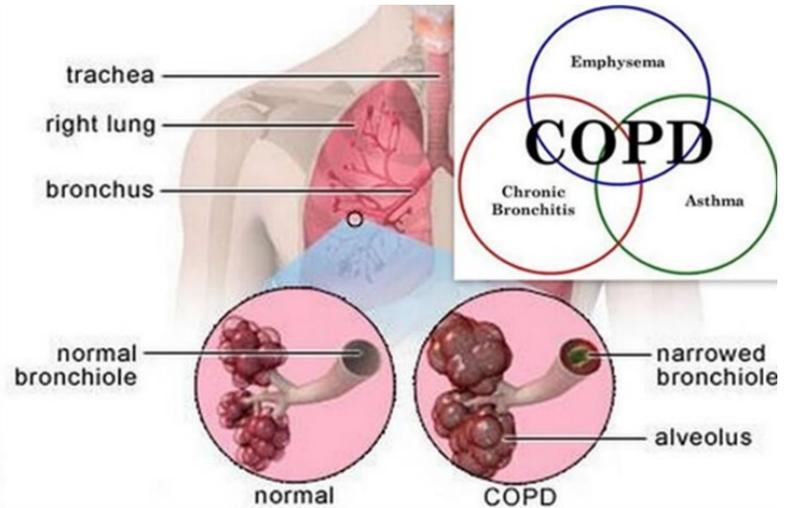
## Asthma

- Symptoms
  - Dry cough, wheezing, chest tightness, trouble sleeping, and shortness of breath.
- Causes: genetic and environmental factors.
  - Exercise-induced asthma
  - Occupational asthma
  - Allergy-induced asthma
- Risk Factors
  - Blood relative
  - Having another allergic condition
  - Being overweight
  - Being a smoker
  - Exposure to secondhand smoke
  - Exposure exhaust fumes or pollution
  - Exposure to occupational triggers



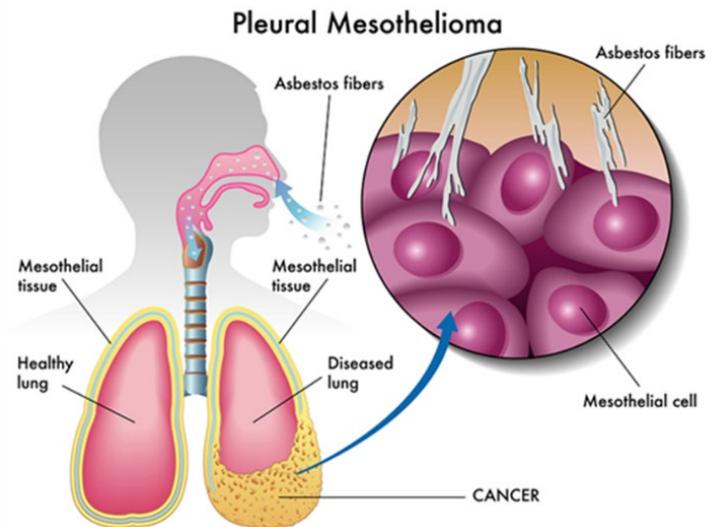
## COPD

- Symptoms
  - Chronic cough, dyspnea, frequent respiratory infections, blueness of the lips or fingernail beds (cyanosis), fatigue, producing a lot of mucus (also called phlegm or sputum)
- Causes
  - Long-term tobacco smoking. (only 20-30% of smokers develop COPD), secondhand Smoke, a genetic susceptibility, air pollution, workplace exposure to dust, smoke or fumes.
- Risk Factors
  - Exposure to tobacco smoke, people with asthma who smoke, occupational exposure to dusts and chemicals, exposure to fumes from burning fuel, age (40+ yrs), genetics (genetic disorder alpha-1-antitrypsin deficiency).



## Occupational Lung Disease

- Types (Scars the Lungs)
  - Asbestosis
  - Coal worker's pneumoconiosis (Black lung disease)
  - Silicosis
  - Byssinosis
  - Hypersensitivity pneumonitis
  - Occupational Asthma
- Prevention
  - Do not smoke.
  - Wear proper protective devices, such as facemasks or respirators.



## What Does it Feel Like to Have a Respiratory Disease?



### Covid -19 Implications

- Covid-19 Definition: Comes from a family of viruses that can cause illnesses such as the common cold, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). COVID-19 identified as the cause of a disease outbreak that originated in China.
- The virus is now known as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and causes COVID-19. In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic.
- COVID-19 research is occurring in real time and is under the world’s microscope. It is evolving everyday.

<b>Covid-19</b>	
Further research is needed.	
<b>WHAT WE KNOW</b>	<b>WHAT WE STILL DON'T KNOW</b>
The virus affects people differently.	Where did the virus come from?
The virus can damage organs.	Why are children less vulnerable than adults?
The virus spreads exponentially.	What is the herd immunity threshold for Covid-19?
Herd immunity usually happens via vaccines.	How long immunity lasts after vaccination and will it become a yearly vaccine?
Most vaccines probably won't prevent transmission but reduce the symptoms when one becomes ill because of COVID-19.	After vaccination, can a person still spread Covid-19?
Indoor ventilation matters.	What are the long-term health implications?
Social distancing, handwashing, and wearing masks are still recommended to reduce the spread of the virus.	What will the next pandemic look like?

### Symptoms of Post Covid-19

- According to the CDC, although most people recover within weeks or months of contracting Covid-19, some do not.
- Experts use the term Long COVID to describe a range of symptoms that can last weeks or months after first being infected. These symptoms can even appear weeks after infection.
- Multiorgan effects, including conditions like multisystem inflammatory syndrome (MIS), where different body parts are swollen and autoimmune conditions where the body attacks healthy cells in the body by mistake.

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Tiredness/fatigue</li> <li>• Difficulty thinking or concentrating (“brain fog”)</li> <li>• Headache</li> <li>• Loss of smell or taste</li> <li>• Dizziness on standing</li> <li>• Heart palpitations</li> <li>• Chest pain</li> </ul> | <ul style="list-style-type: none"> <li>• Difficulty breathing or shortness of breath</li> <li>• Cough</li> <li>• Joint/muscle pain</li> <li>• Depression/anxiety</li> <li>• Fever</li> <li>• Symptoms worsen after physical or mental activities</li> </ul> |
|--|---|

## Exercise & CRD Vicious Inactivity Cycle



### CRD and Exercise Timing of Initiation

- Pulmonary rehabilitation initiated shortly after a hospitalization for a COPD or CRD exacerbation is clinically effective, safe, and associated with a reduction in subsequent hospital admissions.
- Exercise rehabilitation commenced during acute or critical illness reduces the extent of functional decline and hastens recovery.
- Appropriately resourced home-based exercise training has proven effective in reducing dyspnea and increasing exercise performance in individuals with COPD and other chronic respiratory diseases.

### CRD and Exercise Limitations

- Ventilatory Limitation
- Gas Exchange Limitation (Hypoxia)
- Cardiac Limitation
- Lower Limb Muscle Dysfunction Limitations
- Respiratory Muscle Dysfunction Limitations

### CRD and Exercise Screening and Assessment

- Ventilation Function: modified Medical Research Council Dyspnea Scale (mMRC) Dyspnea assessment by modified Medical Research Council dyspnea scale (mMRC dyspnea scale) is a 5-point scale based on degrees of variable physical activities that precipitate dyspnea with a score ranging from 0 to 4.
- Pulmonary Function: Spirometry machine measures how much air one can exhale out of the lungs.
- Functional Performance: The Timed Up & Go (TUG) Subjects are requested to stand up

from a chair, walk a distance of 3 m at a comfortable and safe pace, turn and walk back to the chair to sit down again. (<11)

- Muscular Strength: Peripheral muscle strength to measure 1RM and Dynamometer Grip Strength
- Cardiorespiratory Fitness: 6-Minute Walk Test
- Quality of Life: Health-related quality of life (HRQoL) is a multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning.
- Mortality Rate: The BODE Index (Body Mass Index, Obstruction of Airway, Dyspnea, Exercise Tolerance)
- Postural Screening: Photogrammetry and Plumb Line

### **CRD and Exercise: 6 Key Components**

- Lung Capacity
- Cardiorespiratory Fitness
- Muscular Strength
- Core
- Flexibility
- Posture

### **CRD and Exercise: Lung Capacity/Breathing Exercises**

- Proper Breathing Technique: Breathe slowly during exercise. Inhale through your nose with your mouth closed. The inhalation warms and filters the air. Exhale through your mouth for twice as long as your inhale. Don't pant. That keeps your lungs from getting all the air out. When exercising avoid the Valsalva Maneuver. The Valsalva maneuver is performed by imagining that the chest and stomach muscles are very tight and bearing down as though straining to initiate a bowel movement.
- Diaphragm Exercises: This move strengthens a key breathing muscle, the diaphragm. Lie down with your knees bent or sit in an easy chair -- one hand on your chest, one below your rib cage. Slowly inhale through your nose so that your stomach raises one hand. Exhale with pursed lips and tighten your stomach. The hand on your chest should not move. Do this for 5 to 10 minutes, three or four times a day. Breathing this way will become easy and automatic.
- Pursed Lip Breathing: This exercise reduces the number of breaths you take and keeps your airways open longer. More air is able to flow in and out of your lungs, so you can be more physically active. To practice it, simply breathe in through your nose and breathe out at least twice as long through your mouth, with pursed lips. Gently puff out the cheeks to create pressure. Creating pressure opens up the airways and it also slows down the breath.

### **CRD and Exercise: Cardio Respiratory Fitness**

- Steady State Cardio Exercises: Walking, Cycling, Chair Dancing, Tai Chi, & Water Aerobics
- Interval Cardio Training (HIIT)
  - May be an alternative to standard endurance training for individuals with chronic respiratory disease who have difficulty in achieving their target intensity or duration of continuous exercise because of dyspnea, fatigue, or other symptoms.
- SSC v. HIIT
  - Current studies examining those with COPD have found no clinically important differences between interval and continuous training modes in outcomes including exercise capacity, health-related quality of life, and skeletal muscle adaptation immediately after training.

- However, new studies expand the subjects to include all chronic respiratory diseases beyond COPD. IET is superior to CET in improving exercise capacity and exercise-induced dyspnoea sensations in patients with CRDs; however, the extent of the clinical benefit is not considered clinically meaningful. (Effect of interval compared to continuous exercise training on physiological responses in patients with chronic respiratory diseases: A systematic review and meta-analysis. 2021 Chronic Respiratory Disease Journal)
- FITT Principle-3-5 Days/Week
  - Steady State Cardio (20-60 Minutes)
    - >60% of MHR (Maximum Heart Rate of 220-Age)
    - Borg Dyspnea or Fatigue Score of 4 to 6 (moderate to very severe)
    - Rating of Perceived Exertion of 12 to 14 (somewhat hard)
    - Talk Test: Should be able to say a short sentence while breathing heavy and 2-3 stops for a breath
  - Interval Training: During the Work Phase <60 Seconds (30-90 Minutes)
    - 85-90% of MHR (Maximum Heart Rate of 220-Age)
    - Borg Dyspnea or Fatigue Score of 7-9 (very severe to very, very severe)
    - Rating of Perceived Exertion of 12-14 (somewhat hard)
    - Talk Test: Able to say one or two words
- SOB Body Positioning: Lung Institute



### CRD and Exercise: Strength/Upper Limb

- Patients with CRD frequently experience marked dyspnea and fatigue when performing simple upper limb (UL) activities.
- Typical muscles targeted are the biceps, triceps, deltoids, latissimus dorsi, and the pectorals.
- Kyphotic posture
  - Posterior deltoids
  - Rhomboids
  - Latissimus dorsi

### CRD and Exercise: Strength/Lower Limb

- Reduced muscle strength and endurance in the lower limbs (LL) are related to decreased muscle mass, decreased aerobic capacity, a predominance of glycolytic metabolism, and rapid accumulation of lactate during exercise.
- Multi-joint LL strength exercises that focus on the quadriceps, hamstrings, glutes, and gastrocnemius.
- Improve exercise tolerance
- Lower muscle fatigue threshold
- Improve overall quality of life

\*Source: American Thoracic Society Pulmonary Rehabilitation. (1999)

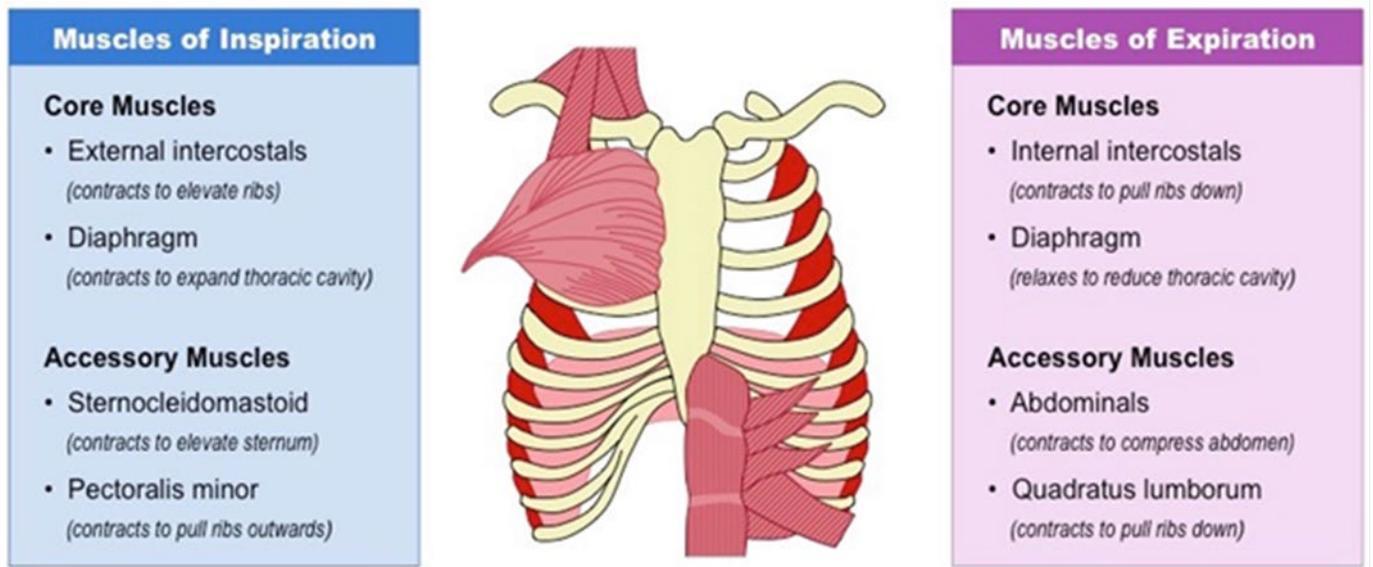
### CRD and Exercise: Peripheral Strength

#### FITT Principle

- Frequency: 2-3 Days/Week
- Intensity: All Major Muscles 60-70% of 1RM
- Time: 8-12 Reps 1-3 Sets

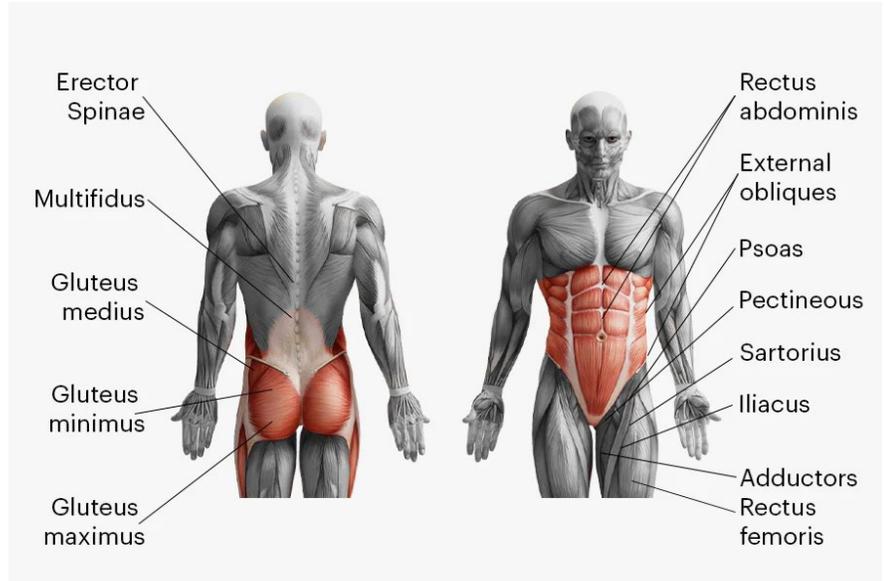
### CRD and Exercise: Strength/Respiratory Muscles

- Inspiratory muscle training (IMT) is defined as a course of therapy consisting of a series of breathing exercises that aim to strengthen the bodies' respiratory muscles making it easier for people to breathe.
- Breathing Exercises
- Studies have shown that regular IMT can increase a person's endurance during cardiovascular exercise.



### CRD and Exercise: Core

- Strength and Stability- Currently, the strength that comes from the core is what is gaining the most attention. It is important, however, that equal emphasis is placed on both strength and flexibility regarding the core.
- Movement- Movement from the core is how the center of gravity is controlled.

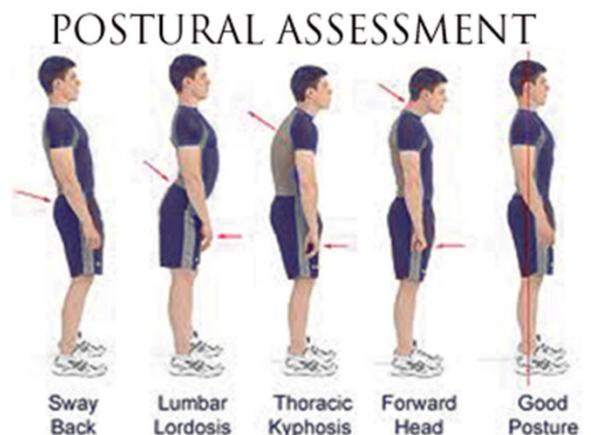


### CRD and Exercise: Flexibility

- Static Stretching is held in a challenging but comfortable position for a period of time, usually somewhere between 10 to 30 seconds.
- Dynamic Stretching is a stretch that is performed by moving through a challenging but comfortable range of motion repeatedly, usually 10 to 12 times.
- Active stretching is stretching a muscle by actively contracting the muscle in opposition to the one being stretched.
- Passive stretching is using some sort of outside assistance to help achieve a stretch.
- Proprioceptive Neuromuscular Facilitation (PNF) is a form of passive stretching. PNF stretching requires stretching a muscle and then forcefully contracting that muscle before stretching it again.
- FITT Principle
  - 2-3 Days/Week or After Each Workout
  - Stretch to a Mild Discomfort
  - Hold for 15-30 Seconds/2-3 Sets

### CRD and Exercise: Posture

- Kyphosis-Rounding of Shoulders
- There is a relationship between pulmonary function and postural misalignment in COPD patients.
- Loss of postural control is one of the most common comorbidities in elderly subjects.
- There is some evidence that can explain a possible association between aging, COPD, and impaired postural control that might predispose these patients to an increased risk of falls.
- Improved thoracic mobility and posture may increase the vital capacity in patients with chronic respiratory disease.



## **The Role of the Respiratory Disease Fitness Specialist**

- There is a need for a health/fitness specialist who understands COVID-19 and can provide specialized training beyond the basic fitness professional.
- The RDFS Focuses on Special Conditions: What quickly became unique about COVID-19 is that the virus not only attacks one part of the body but many parts of the body. Being an RDFS provides solutions for many people who suffer from post-COVID symptoms and want to become stronger and healthier. Providing those health/fitness solutions requires a specific type of education and training that applies to the post-COVID client--far beyond the education of a primary health and fitness professional.
- The RDFS's Role in Prevention of COVID-19: The RDFS plays a crucial role in preventing many diseases that increased the risk for those who contracted COVID-19. Those who were at greater risk for COVID-19 had preexisting conditions such as obesity, diabetes, chronic respiratory disease, and a lower immune system.
- The RDFS as an Educator
- The MFS as a Relationship Builder
- Local Medical Community
- Specialized Support/Social Media Groups

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