

Now You Can<sup>®</sup>

## The Inter-thoracic Connection

SLP Collaboration with PT and  
RT for Improving Breathing  
Mechanics

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## Authors



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## Disclosures

Rebecca Wills is a part time consultant with Passy Muir, Inc.

Conference related expenses for Rebecca Wills and Sarah Economides have been paid for by Passy Muir, Inc.

Passy-Muir, Inc. has developed and patented a licensed technology trademarked as the Passy-Muir® Tracheostomy and Ventilator Swallowing and Speaking Valve.

This presentation will focus primarily on the biased-closed position Passy-Muir Valve and will include little to no information on other speaking valves

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## Learning outcomes

Participants will list and describe

- The function of the muscles of respiration and their relationship to postural control
- Three postural techniques to enhance breathing mechanics for speech
- Three devices and technology for improving breathing mechanics for speech



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## What is respiration?

Webster's definition: *The act of taking in or giving out air.*

Is it really that simple?



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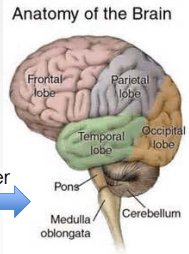
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## What is respiration?

Anatomy of the Brain



Respiratory center of the brain

[Kb4brainfunction.com](http://Kb4brainfunction.com)



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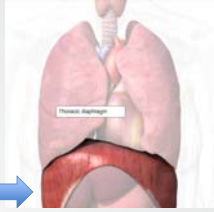
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## A & P of respiration

- Diaphragm is primary muscle of breathing
  - innervated by phrenic nerve at the C4-5 level
- Diaphragm is responsible for approx. 2/3 of tidal volume during normal breathing



yogacolorwellness6.blogspot.com




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## A & P of respiration

**Inspiration:** diaphragm descends with contraction creating negative intra-thoracic pressure



**Expiration:** diaphragm relaxes and moves up

Libbyasbestos.org




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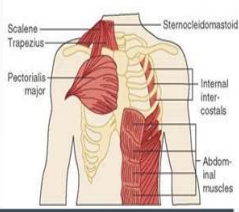

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## A & P of respiration

Accessory muscles of inspiration

All these muscles may be activated to increase tidal volume or to compensate for weak diaphragm


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## A & P of respiration Now You Can!

Accessory muscles of expiration

- ▶ Exhalation is normally passive due to the natural recoil of lungs
- ▶ Accessory muscles may be recruited to assist in exhalation in times of respiratory distress, diaphragm paresis and to assist in upward movement of diaphragm



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## A & P of respiration Now You Can!

**Muscles of inspiration**

**Accessory**

- Sternocleidomastoid (elevates sternum)
- Scalenes Group (elevate upper ribs)
- Not shown:*
- Pectoralis minor

**Principal**

- External Intercostals (interchondrial part of internal intercostals) (also elevates ribs)
- Diaphragm (same direction, thus increasing vertical dimension of thoracic cavity; also elevates lower ribs)

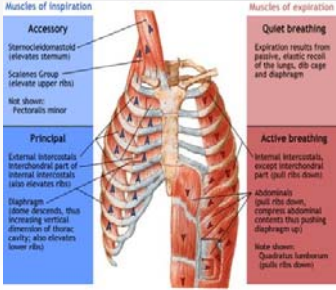
**Muscles of expiration**


**Quiet breathing**

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

**Active breathing**

- Internal Intercostals, except interchondrial part (pull ribs down)
- Abdominals (pull ribs down, compress abdominal contents thus pushing diaphragm up)
- Not shown:*
- Quadratus lumborum (pulls ribs down)





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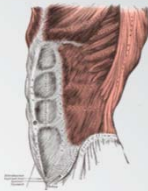
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## Posture and trunk control Now You Can!

Musculoskeletal trunk muscles are primary posture muscles

- Diaphragm**
  - thoracic and abdominal pressure
- Intercostals**
  - thoracic pressure
- Abdominals**
  - thoracic and abdominal pressure
- Paraspinals**
  - stabilize spine and ribcage





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