

The Breath and Core

Breathing is currently a buzz word in the rehab, strength and performance settings.

Recently Physical Therapists, Chiropractors, Personal Trainers and Strength Coaches have been discussing breathing and how it relates to core stabilization and shoulder, neck, back and hip pain. Researchers observed that the diaphragm contributes to spinal stability by adding to intra-abdominal pressure and enhanced spinal stiffness. In a performance setting breathing and “bracing” properly can help to increase strength and promote improved recovery through promoting a return to a relaxed parasympathetic state after a hard workout.

I am not the first person nor will I be the last to discuss breathing and how it relates to posture, hip pain, back pain and shoulder pain, core stability and athletic performance.

We all know that the diaphragm should be the primary muscle of inhalation as it “acts like a pump at the base of the lungs. If you watch the video below you will see the 4 month old breathing diaphragmatically, eliciting a proper overall expansion of its belly to the front, sides, and back. This is what a proper diaphragmatic breathing pattern looks like.

<https://www.youtube.com/watch?v=5q-wXIKSxD8>

The central nervous system drives this pattern. Nowhere during development did someone teach the baby to breath this way, he intuitively knew that in order to survive, this is how it needed to breathe. When the baby breathes this way his diaphragm is contracting and relaxing properly and by doing so he is able to promote the proper exchange of gases in a passive manner, not even thinking about each breath that he takes. This diaphragmatic breathing then serves as the baby’s basis for core stability as he will brace from his diaphragm prior to reaching outside of his base of support, learning to crawl and squat. You will not see an increase in lumbar spine lordosis in any of these movements. Instead you will see a cylindrical expansion of the belly to promote core stability. This is not always the case in an adolescent or adult.

As people age whether it be daily CNS stressors or postural habits somewhere along the line most of us lose the ability to properly breathe with our diaphragm. Look at your next patient. Do you see their chest rise and neck muscles turn on? Are they using their chest and neck muscles to drive their breathing pattern, or do you see their belly cylindrically expand?

Breathing apically, or with upper chest and neck musculature, can lead to many physiological and structural changes that can negatively influence a person’s spinal column and pelvic positioning and resulting soft tissue attachments. There is an anatomical link between the diaphragm, psoas, and pelvic floor and summarized the integrated structure as follows;

The pelvic floor muscles are part of a multi-structural unit forming the bottom of a lumbopelvic cylinder with the respiratory diaphragm forming its top and transversus abdominis the sides. The spinal column is part of this cylinder and runs through the middle, supported posteriorly by segmental attachments of lumbar multifidus and anteriorly by segmental attachments of psoas to the abdominal muscles.

When any of these central structures are out of position or alignment, i.e. increased soft tissue restriction, weakness, lumbar spine lordosis, increased anterior pelvic tilt or elevated rib position, injuries occur due to a weak link in the kinetic chain. For instance in a patient with an elevated rib position their scapulae will not sit in an optimal, mechanically advantageous position and the glenoid fossa will be affected which affects how the humerus tracks in the glenoid. When a patient has an increased anterior pelvic tilt or increased lumbar spine lordosis we all know of the stressors placed on the spine and hips during activity that lead to pathology.

In patients with low back pain, studies found that these individuals tend to have poor core muscle activation and brace their superficial abdominal muscles and diaphragm. This negatively influences normal diaphragm function, inhibiting abdominal breathing and encouraging an upper chest or apical breathing pattern. This can lead to neck pain, rounded shoulder posture and resulting rotator cuff or thoracic outlet syndrome symptoms.

As you see everything is connected and not all pathologies originate at the point of pain. Often there is an underlying cause somewhere else in the kinetic chain that leads to the patients presenting symptoms. By no means are proper diaphragmatic breathing patterns the end all be all but it is certainly an often overlooked component to the treatment plan of care and subsequent rehabilitation.

Below is adapted from Mike Reinold with modifications and can be found at <http://www.mikereinold.com/2013/04/breathing-pattern-disorders.html>.

- High scores on the Nijmegen questionnaire have been shown to be both sensitive and specific for detecting people with tendencies consistent with breathing pattern disorders.
- Observe breathing patterns for cylindrical belly expansion forward, laterally and posteriorly. Lower ribs should expand laterally and there should be minimal superior upper chest excursion.

How does this relate to rehabilitation?

Roussel et al (2009) have reported that more than half of patients with chronic non-specific low back pain exhibited altered breathing patterns during performances in which the trunk-stability muscles are challenged. Also a randomized control trial performed by Mehling et al in 2005 suggested that in patients with a year long history of chronic low back pain significant improvements in both pain and function were seen after either breathing rehabilitation or physical therapy for 8 weeks. It is also a widely known fact

that a focus on breathing can help promote relaxation and subsequent pain perceptions as exemplified by Whitmore (2002)

Finally, Musnick (2008) has outlined a protocol that places the role of breathing rehabilitation into context, when managing musculoskeletal pain:

1. Reduce the synergistic inputs to the pain process (i.e. modify adaptive demands)
2. Deactivate trigger (or tender) points
3. Remove noxious input from scars
4. Enhance spinal and general joint functionality
5. Improve muscle recruitment, strength, flexibility
6. Pay attention to exacerbating factors in diet, lifestyle and habits (sleep, exercise, posture, balance, breathing)
7. Consider emotional/psychological factors

To reiterate by no means is diaphragmatic breathing the cure all for all pathologies as they relate to the trunk and core though it is an often over-looked component. This may be the missing link in the plan of care that may help your patients to recover more quickly or fully recover after an injury that seems to linger longer than it should.

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