

Breathing Patterns and Performance: Lungs, Diaphragm, Ribs Can Impact Posture and Body Mechanics

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A variety of “hot” discussion topics and analysis fly through the fitness and strength and conditioning industries: minimalist footwear, CrossFit, to stretch or not to stretch, high intensity versus sport-specific training, and nutrition and supplements. And that’s just naming a few.

It can be overwhelming. What’s a weekend warrior to do?

One topic I notice in discussions among fitness professionals these days is breathing. A dialogue about breathing and breathing mechanics is entirely appropriate, yet it is a subject that is often overlooked by healthcare and fitness professionals. Good breathing with proper mechanics is hugely important for posture and dynamic body mechanics. Aside from their obvious important role in gas exchange, the proper function and movement of the lungs, diaphragm, and ribs will influence the position of bones (posture) and the ease with which people can move in and out of one position or another.

Everyone breathes by contracting and relaxing muscles. While this may be automatic and mostly subconscious, it’s important to recognize that like all skeletal muscles, the muscles involved in breathing attach to bones. Since movement of the bones depends on the function of the muscles that control them, it’s pretty important that muscles are working properly, turning on and off when they’re supposed to. Problems occur when a muscle or a group of muscles are overactive and don’t know how to turn off in a timely manner, or conversely if they aren’t turning on when needed. The muscles and bones involved in breathing are no different, and mechanical breathing disorders are much more common than one might think.

The diaphragm, our primary breathing muscle, is attached to the lower ribs and spine. While it plays a more important role in respiration than any other muscle, its role in stabilization and movement of the rib cage and spine is significant. Any disturbance in respiratory depth and rate will have an effect on posture because of the diaphragm’s attachment to the ribs and spine. For example, someone who is over-breathing (or over-inhaling) will have an overactive diaphragm. Just like with any skeletal muscle, if the diaphragm is overworked, it will develop a pattern of increased tone and tightness that results in an inability to relax and return to its resting (“off”) position. The spinal segments and ribs that the diaphragm attaches to will be pulled into positions that are then difficult to move out of. Postural changes and ability to perform variable tasks in multiple positions will be seriously challenged, all because of a diaphragm that doesn’t know how to relax.

I see many athletes who are exceptional at their sport but develop breathing patterns that lock them into postural patterns that they can’t get out of until they improve how they breathe. Picture runners that have a very deep lower back curve, a very upright posture, with lower ribs

that seem to stick out. This is called an extended posture, meaning the lower thoracic and lumbar portion of the spine is in extension (or bent back) with all of the complementary position issues related to that—a forward-tilting pelvis, lower ribs that are flared, shoulder blades that are lifted and rounded forward. They may even look like this when they're not running, but this posture is accentuated when they run.

This type of posture is often associated with a breathing mechanics dysfunction. Airflow in and out is more challenged when the lower ribs are flared, so these folks will have to use neck and back muscles to help pull air in. They also may not be able to get air out efficiently (i.e. their ribs never drop down from a position of inhalation) so they never come out of the overly extended position and into a more relaxed-looking flexed position. This is a very common presentation in my physical therapy practice. The causes are many and include poor habits, inherited genetic makeup, hyperventilation, sympathetic (or autonomic nervous system) over activity, poor abdominal muscle activation, over-developed lats and pectoral muscles, a head-forward posture related to jaw or airway issues, and trauma (to the ribs, the spine, and even the brain). These are just a few causes, as this is a fairly complex issue.

Another very important point is this: the diaphragm is one of only two skeletal muscles in the body that is not paired (meaning people only have one) and it's not shaped even remotely similarly on either side of the body's midline. The right side of the diaphragm is very dense and strong while the left side is much thinner and weaker. Hence, when it is contracting, it exerts an asymmetrical pull on the bones it attaches to. In other words, when people are breathing hard, there is going to be a strong tendency for the spine and the rib cage to twist. And if a poor breathing pattern exists, the tendency for torque and twist is much greater.

Here's another example: the CrossFit athlete with some hip pain who presents with an obviously imbalanced pelvis, ribs that are flared to the left, and a right shoulder that consistently looks lower than the left. Upon assessing his breathing pattern, it is clear that he is having trouble getting expansion of his ribs on the right and there is a very strong tendency to lift the left side of the rib cage on inhalation. This is a classic situation, especially for the CrossFitter who has overdeveloped lats, pectoral, and back muscles. He, too, is having trouble getting out of an extended posture and into one that allows the diaphragm to consistently completely relax on exhalation. The "on" postural position starts twisting his pelvis, spine, and ribs.

Most humans take eight to 12 breaths per minute at rest. Under stress and during exercise, the rate may increase two- to threefold. A faulty breathing pattern under calm circumstances may be bad enough, but there will certainly be repercussions in an active athlete with bad breathing mechanics. So if an athlete is having issues that don't seem to be improving with traditional treatment, there may be a breathing pattern disorder that can be uncovered by someone trained in the assessment and treatment of these types of problems.