Revisiting an old blog from Jason on pelvis and rib cage positioning

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LET'S GET "SQUARED AWAY"!!

The saying "squared away" means that one is in an adequate position for whatever has to be done next. This saying has nothing to do with something actually being squared in shape or form. It means: everything is in order; everything is arranged/ positioned and taken care of. On the other hand, when you look at the human body, you can shape it by creating or arranging it to determine its form. Postural Restoration Institute® concepts/principles are governed by posture, position and patterns. In every moment we are shaping our bodies into a posture that corresponds to the demands placed upon it. Something that arranges and repeats itself in a predictable way is a pattern. The body is shaped by how we use it and patterns govern how we function. We all fall into patterns which create postures that reflect our body's overall shape and/or position. Geometry is a term concerned with the study of basic shapes. Shapes are used to suggest meaning and organization. It's sometime easier to picture the human body as an arrangement of geometric shapes. The body's shape affects the body's posture, position and patterns. A trapezoid and a square are two common shapes. In this blog I will illustrate how the body grows more accustomed to the shape of a trapezoid and, by implementing Postural Restoration Institute® concepts we can reshape it into a square. It is this shape-changing ability that is most relevant to breathing, because without this movement, the body cannot breathe at all. To understand how the diaphragm causes this shape change, I will examine its shape and location in the body, where it's attached, and what is attached to it, as well as its action and relationship to the other muscles of breathing. This geometrical relationship is important to recognize, not only to distinguish the body's overall shape, but for another reason: so that we can understand how the body functions in regards to its overall position! Successful function, of course, expresses itself in a particular shape. In order to understand this relationship, we will start with the basic anatomy, function, and mechanics. For starters, the pelvis is directly connected to the spine. Therefore, the position of your pelvis will affect the position of your spine and rib cage. The combination of an elevated chest (rib cage) and an anteriorly tilted pelvis is a common posture that severely compromises the capability to attain proper stabilization of the pelvis and ribcage. In an ideal world, the ribcage and the pelvis should be relatively horizontal and/or parallel to each other for efficient breathing to occur. The importance of breathing cannot be overemphasized. On average you breathe about 24,000 times per day. Postures can contribute to proper breathing as well as cause breathing restrictions you hope to eliminate. Yet how much attention are you giving to your breath as it relates to the position of your pelvis and your rib cage? As an example, the diaphragm contracts approximately 24,000 times a day and ultimately changes the position of the pelvis and rib cage with each breath. Even the smallest restriction of movement, whether it is the pelvis or the rib cage, can result in a significant consequence, as the diaphragm is stressed 24,000 times a day! Fortunately, this cumulative affect works both ways. In other words, not only can changing the position of the pelvis affect rib cage position, but likewise, rib cage position can affect pelvic position. Let's look at some of the structural implications of the positioning of the pelvis and how it relates to the rib cage. Let's say the pelvis

is a bowl and the bowl is full of water. A forward pelvic tilt would tilt the bowl forward spilling the water out in front; likewise, a backwards pelvic tilt would tilt the bowl back spilling the water out the back. Dysfunction in your pelvis will "spill over" and create a dysfunction in your spine. Any dysfunction in your spine will create a dysfunction in your rib cage. Therefore, a forward tilt of your pelvis would elevate the front of your ribcage; likewise a backward tilt of your pelvis would lower the front of your rib cage. (Figures 1 & 2)

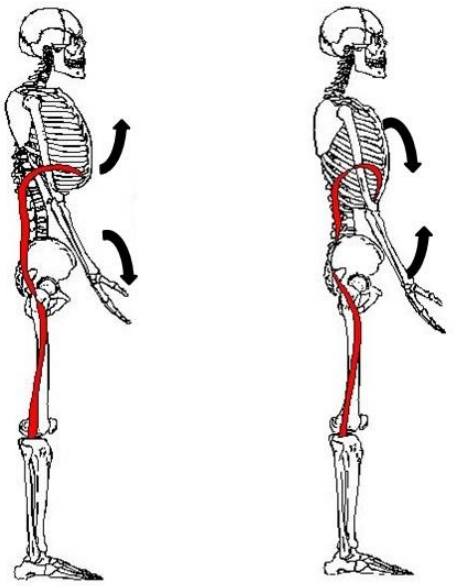

Figure 1:

Forward tilt of pelvis and elevated lower cage.

Figure 2:

Backward tilt of pelvis and depressed lower rib cage.

Now let's take a look at how the muscles that affect the position of your pelvis and rib cage and put it together. Remember that a muscle has at least two attachment sites. When a muscle contracts, it shortens, bringing the two attachment sites closer together. The muscles that attach to the front of the pelvis and the upper leg are called the hip flexors. When they contract they bring the leg closer to the front of the pelvis. This muscle would either lift the leg or they would tip the front of the pelvis down when they contract. Muscles that attach to the back of the pelvis and back also tip the front of the pelvis down when they contract. These paraspinal muscles can be chronically tight and your pelvis therefore could be chronically tipped forward into an anterior tilt.

The hamstrings, gluteals, and abdominal muscles work together to tilt your pelvis backwards. The hamstrings and gluteals have attachments on the pelvis and upper legs. When they contract they pull the back of the pelvis down towards the backs of the legs, while the abdominal muscles pull the front of the pelvis upwards. Ideally there should be a balance between the muscles that tilt the pelvis forward and the muscles that tilt the pelvis backwards, especially when upright.

The diaphragm interconnects your rib cage, spine, and pelvis. Because of these relationships the diaphragm is significantly influenced by posture and continuously influences breathing. When viewing from the side, the diaphragm looks like a big upside-down letter "J" that forms a floor across the lower rib cage. The diaphragm is connected in the front, along the sides of your lower ribs, and also along the front side of your spine. The intercostal muscles are the muscles between each of your ribs. There are two types of intercostals. The external intercostals are responsible for pulling the rib cage up and out during inhalation. The internal intercostals are the muscles of exhalation; they pull the ribcage down and in.

The pelvis and its direct attachment to the spine is the determining factor for the shape of the diaphragm, and must be supported by the muscles that attach to the rib cage and the pelvis. Therefore, when the rib cage changes shape, so does the diaphragm. For this reason, inhalation suggests a forward tilt of the pelvis, facilitating spinal extension and thus positioning the diaphragm more towards the shape of an upside-down letter "L". Whereas, exhalation suggests a backward tilt of the pelvis and facilitates spinal flexion, thus positioning the diaphragm more towards the shape of an upside-down letter "J". (Figures 3 & 4) Breathing is rhythmic. The rhythmic movement of your diaphragm is constantly changing from an upside-down letter "J" to an upside-down letter "L" with every inhalation and exhalation you take during the breathing cycle.

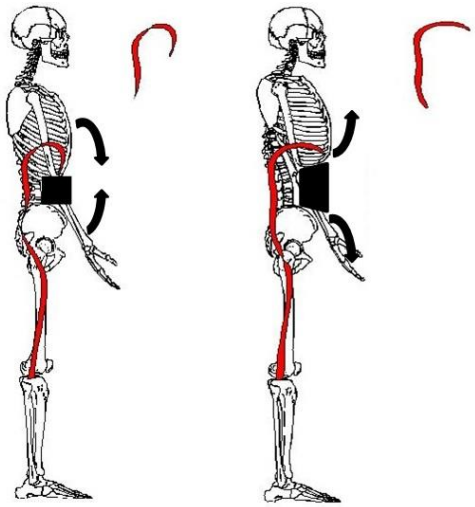

Figure 3:

Backward tilt of pelvis and depressed lower rib cage resembling the shape of a square. Diaphragm positioned like an upside-down letter "J".

Figure 4:

Forward Tilt of pelvis and elevated lower rib cage resembling the shape of a trapezoid. Diaphragm positioned like an upside-down letter "L".

On inhalation, the diaphragm muscle contracts, and pulls the bottom of the lungs downward causing them to fill, while the ribs flare upwards and outward to the sides. When the external intercostals pull the rib cage upwards and outward the upside-down "J" flattens into an upside-down letter "L". On exhalation, the internal intercostals and to some degree the abdominals pull the rib cage down and inwards restoring the diaphragm to its original position of an upside-down letter "J".

During inhalation, the diaphragm flattens into an upside-down letter "L" as it descends and meets the resistance of the abdominal muscles and abdominal contents. The diaphragms activity depends on the position of the spine and rib cage, which forms a "fixed point". The term "fixed point" implies which attachment site of a muscle that remains "fixed" or stationary and allows the opposite attachment site of the muscle to freely move. As with all muscles, the type of movement the diaphragm produces will depend on which end of the muscle is stable and which is mobile. If the rib cage is in the inhalation position, with the sternum and ribs elevated, the activity of the diaphragm is impaired. This particularly affects the lumbar section of the spine. Due to the diaphragm's attachment to the front of the spine, every subsequent breath you take now pulls your pelvis into a forward tilt. Breathing is then limited to the upper rib cage, which is pulled upward by the accessory respiratory muscles of the neck.

As a result of this position, normal pelvis, rib cage, and diaphragm biomechanics are disrupted, and subsequently, the entire function of the diaphragm is altered. The back muscles use this fixed point as an opportunity to contract and further arch the spine. This fixed position of an elevated rib cage and forward tilt of the pelvis results in increased lower back tension as well as increased activity of the upper accessory respiratory muscles of the neck in attempt to get more air into the lungs. Furthermore, this prevents the diaphragms ability to return to a relaxed resting position during the exhalation phase of breathing.

Mechanical relaxation is the process by which the muscle actively returns, after contraction, to its initial length and load. The diaphragm, like every other muscle in our body, likes a proper resting length. The diaphragm contracts and relaxes continuously throughout life and must return to a relative constant resting position at the end of each inhalation-exhalation cycle. Muscles function the best when close to an ideal length (often their resting length). When muscles are stretched or shortened beyond this (whether due to the action of the muscle itself or by a sustained position or posture) the force generated by the muscle decreases.

An elevated rib cage affects respiratory musculature function by causing the muscles to operate in an undesirable position and by flattening the curvature of the diaphragm. If the rib cage remains fixed in an upward position, the diaphragm's mechanical purpose is obviously compromised. The diaphragm does not have the length and force to allow the rib cage to move through its full range of motion required for a full breath. The diaphragm's shape changes from an upside-down letter "J" to an upside-down letter "L" as a result of the undesirable positioned rib cage and pelvis.

Difficulty breathing usually originates from restricted movements of breathing and usually from incomplete exhalation. The muscles include the diaphragm, abdominal, and neck musculature that hold the rib cage in an elevated state. As a result, individuals exhale incompletely.

Individuals who exhale incompletely as a result of ribcage and pelvic position habitually have an expanded chest, hanging belly, high shoulders, and a shortened neck. The expanded chest results from the rib cage being in a state of inhalation due to the pelvis being forwardly tilted and the rib cage being elevated. The hanging belly comes from a diaphragm that, being always partially

contracted and more towards the shape of an upside-down letter “L”, pushes the abdominal contents down and out of their normal position; the high shoulders come from contracted “shortened” neck musculature lifting the upper ribs in a chronic attempt to get more air into the lungs.

Now let’s get “squared away”! The diaphragm’s mechanical action and respiratory advantage depends on its relationship and anatomic arrangement of the pelvis as it relates to the rib cage. As stated earlier, when you inhale your rib cage elevates while the front of your pelvis tilts forward. Using the upper pelvis and lower rib cage as reference points, this inhalation position resembles the shape of a trapezoid. Likewise, as you exhale your lower rib cage is pulled down while the front of your pelvis tilts backward resembling the shape of a square. Using the Postural Restoration Institute® non-manual techniques you can guide the rib cage and diaphragm into a position where the diaphragm regains proper mechanical advantage to efficiently contract and can rest, resembling the shape of an upside-down letter “J” rather than an upside-down letter “L”. (Figures 3 & 4) The muscles often recruited to maintain the diaphragm, rib cage, and pelvis in the proper position include the abdominal obliques, hamstrings, and gluteals.

Allowing the diaphragm, rib cage, and pelvis to be literally “squared away” will allow these structures to obtain an adequate position/shape for whatever has to be done next, thus allowing normal breathing mechanics to occur. When the diaphragm, rib cage, and pelvis are positioned properly, correct breathing patterns are simplified, producing a more adequate posture. The ideal posture for diaphragmatic function occurs when the pelvis is level and the chest isn’t sticking out or elevated. This results in improved movement with greater strength, power and endurance.