Returning to Center

Kelsi N. Giswold

Kelsi N. Giswold BFA, LMP graduated from the Soma Institute of Neuromuscular Integration®. Previously, she studied art and design at Western Washington University. She currently practices in Seattle and Langley, WA and can be reached via her website, www.kgiswold.net.

The Core is a dynamic concept that can be seen through the eyes of anatomy, structure, movement, behavior, beliefs, and spiritual awareness. Generally speaking, our core muscles support our trunk—our lower back, abdomen, and pelvis. If these muscles are weak or malfunctioning this can lead to injuries, and chronically painful structural aberrations. Strengthening and engaging the core muscles to alleviate lumbar pain is becoming more and more common. This idea, however, of energizing our core is not new; it's been known for centuries in traditions around the world. Here, we will explore the anatomy of the core stabilizing muscles, and how the nervous system contributes to the core's ability to properly function. We will also discuss the multi-dimensional view of the core as seen in Soma Neuromuscular Integration® (SNI®), and the connections between the physical and emotional.

From the legacy of Ida P. Rolf, we recognize that breath and posture are vital to our ability to have balance around the line, and can therefore create possibilities for optimum core engagement. As Structural Integrators, we see the body as it relates to the gravity field. We recognize that the 10-Session sequence strengthens core support, allowing the tissue to retain changes. Although mainstream practitioners have recently picked up the word "core," core work has been in the realm of Structural Integration since the beginning.

We find an emphasis on the abdominal and lumbar region of the body common in the body-mind practices of many cultures, and under many names as well. In Japan it's called *hara*, in Chinese martial arts or medicine it's *dantian* or *tan t'ien*, and in yoga it's the *manipura chakra* or third chakra. So what is so important about this region, what is "core"? As we will explore in this article, our core muscles and their sensing and responding abilities are important for our physical vitality and perhaps reflect our emotional wellbeing too.

The Territory of the Core

Dr. Rolf is said to have described the core as "everything you can't live without."[1] While to some there is ambiguity as to where the core begins and ends, let's explore the core that includes the floor of the pelvis at the bottom, and the diaphragm at the top. According to Mary Bond, the core muscles surrounding the viscera create an "open" fascial bag filled essentially with water—since our organs are 90% water.[2] Aline Newton in her article "Core Stabilization, Core Coordination," writes that the two slings create an empty or open space where movement can originate from, and also move through. There is possibility in an empty core. With this in mind, we will explore the dynamic relationship of stability and mobility, where the tonic or intrinsic muscles give stability and the extrinsic or phasic muscles provide mobility actions.

Anatomically, the core consists of tonic, stabilizing muscles. They are generally smaller, slow-twitch, deeper and closer to the joints, and often referred to as local muscles or the inner corset. Because these muscles rely on oxygen, they are best suited for endurance activities.

The sleeve is quite the opposite; it consists of prime movers or phasic muscles. They are responsible for large movements, contain predominantly fast-twitch fibers and are often more superficial. These muscles rely on glucose for their energy and are referred to as global muscles or the outer corset.

All tissue originating from the pelvis is supported through the core by the dynamic suspension relationship of the spine and ribs. Together they create the structure of a container capable of supporting and opening the core—the beginnings of our cylinder of compression. The spine connects the pelvic and respiratory diaphragms.

It is essentially the ossification of the line of inertia, or the bony structure that supports the body in gravity. In the sagittal plain it obviously deviates and curves, but in the coronal plain the central "line" places equal weight distribution and, ideally, mobility through the vertebral column.

The Inner Corset—The Core

There are many muscles that make up the core or inner corset including the pelvic floor muscles, internal obliques, respiratory diaphragm, and the two most widely accepted core stabilizers, the transverse abdominis (TA) and the lumbar multifidus. The transverse abdominis originates on the inner surface of the lower six ribs, the lumbar fascia, iliac crest, and lateral part of the inguinal ligament. It inserts at the abdominal aponeurosis of the linea alba. Together the linea alba and transverse inscriptions literally hold the guts in place, while also providing attachments for the broad sheets of musculature that exist there. The transverse abdominis has one action, to compress the abdominal contents, it squeezes and nothing else, no bending, twisting or tilting of the trunk. Its responsibility with the lumbar multifidus is "not to move the spine, but to stabilize it so that other muscles can move the trunk without compromising the integrity of the joints."[3] Because of its horizontal orientation the transverse abdominis has the ability to affect each vertebrae precisely, an important function for its stabilizing action.

The lumbar portion of the multifidus has many of the same biomechanical attributes as the transverse abdominis. The multiple fascicles of this muscle originate on the sacrum and the transverse processes of the spine and insert at the superior spinous processes of the vertebrae, spanning all the way from the sacrum to C4. While the multifidus is said to be partially responsible for extension of the spine, for rotation of the spine to the opposite side, and as a stabilizer, its primary role does not include the production of motion.[4] There is evidence that the deep fibers of the lumbar multifidus only minimally change length throughout the range of motion. Rather, contraction of the lumbar multifidus and transverse abdominis increases the stability of the lumbar spine and trunk. This is achieved without prohibiting movement by the larger global muscles like the rectus abdominis and external obliques. Newton explains that "Co-contraction at the level of deep, local muscles can create support without restricting bigger movement."[5] Interestingly, studies have shown that the transverse abdominis in healthy backs contracts 110 milliseconds before the use of the arms or legs. This creates a supportive base for the limbs to move from, and allows support for our orientation to space and grounding.

The internal obliques are part of the stabilizing system, specifically the part that originates from the thoracolumbar or lumbar fascia. The lumbar fascia covers and supports the deep muscles of the back. It attaches to the lower ribs, thoracic, lumbar and sacral vertebrae, as well as the iliac crest and various ligaments of the lower back and pelvis. Simply put, it's a very important stabilizing sheet of connective tissue, which allows greater mobility for the adaptive capacity of our breath through the lumbo-dorsal hinge.

Interestingly the internal obliques originate partially from the lumbar fascia (also from the lateral inguinal ligament and iliac crest), and their insertion is on the last three or four ribs and the abdominal aponeurosis of the linea alba. We can begin to see how the internal obliques can be responsible for stabilization as well. They are deep, just one layer superficial to the transverse abdominis. With both sides working bilaterally, they are responsible for flexion of the spine, and compression of the abdominal contents or stabilization of the spine. When only one side is contracting, lateral flexion of the spine and rotation to the opposite side takes place.

It becomes clear that all of these muscles combined create a girdle or "cylinder of compression" around the viscera and spine. They have the ability to hold and stabilize this cylinder, yet also allow it to move, twist, and support the limbs above and below. This corset however is only part of the cylindrical myofascial bag that allows for movement yet is able to hold its contents; our bag needs a top and bottom that are both sturdy, yet expandable. Diaphragms are the perfect solution (Figure 1).

Completing the Cylinder of Compression

Diaphragms—the arches of our body, are expandable and contractible muscle sheets. According to Newton, all the diaphragms of the body "can be seen as part of a single functional system. Acting together, they energize a movement.…"[6]

The respiratory diaphragm is a broad dome-shaped muscle that originates on the bodies of the upper lumbar vertebrae via the right and left

cruces, and on the interior surface of the lower ribs and xiphoid process. It runs up toward the clover-shaped central tendon at the top of the dome. The central tendon is not attached to any bones; rather it is an area of connective tissue that creates the top of the dome and connects the converging muscle.

The respiratory diaphragm and its central tendon are important to core stabilization. The activation of the transverse abdominis compresses the abdomen, holding the central tendon in place. With a grunt, or quick exhale, as from heavy lifting, the diaphragm crura that are attached to the upper two to three lumbar vertebrae are also supported. This, Newton explains, minimizes compression of the discs by pulling them forward. Perhaps the guttural sounds voiced in some martial arts aren't just for show after all.

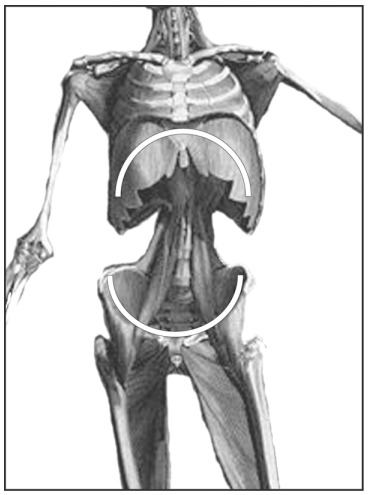

Figure 1. The respiratory and pelvic floor diaphragms are the top and bottom of the core. They confine the open space of the viscera, creating an expandable and contractible bag.

Other actions of the respiratory diaphragm include, of course, inhalation. Contraction of the diaphragm draws down the central tendon, increasing the volume of the thoracic cavity and lungs, allowing air to flow in. This movement expands the lower ribs in all directions and compresses the viscera downward. Just as the respiratory diaphragm compresses and supports the viscera from above, the pelvic diaphragm supports from below.

The pelvic diaphragm or pelvic floor consists of the levator ani (and its three parts) and coccygeus muscles. This diaphragm supports the viscera from below, holding them in place and creating the bottom of the cylinder of compression.

"The most effective center is empty."[7] This empty center is surrounded by the cylinder of compression, which includes the diaphragms on the top and bottom and the transverse abdominis and multifidus encircling the viscera and spine. There are other muscles that are believed to help with stabilization too, but to a lesser extent. These include the internal obliques, the posterior fibers of the psoas major, the erector spinae group, the medial fibers of the quadratus lumborum and the remaining transversospinal group. When all of these muscles are working together and in balance, the viscera and breathing are able to function optimally. Furthermore the lumbar spine is able to support the head and shoulders with ease. It becomes clear that the quality of the muscles around our watery center is important for stabilization and movement (Figure 2).

This cylinder of compression creates a space that is fully supported, yet also expandable. Interestingly, studies have shown that in people with no history of back pain, these core muscles contract before the larger moving muscles.[8] This supports the idea that these muscles are needed as a base from which efficient movement can occur. Peggy Hackney in her book *Making Connections*, views core support this way: "I experience in that person an alive, central core which actively engages to both uphold the body and energize interaction within the individual and with his/her environment…When I do not see core support I see an individual moving in a way which seems strained or inefficient, pushed or held up by something other than the core."[9]

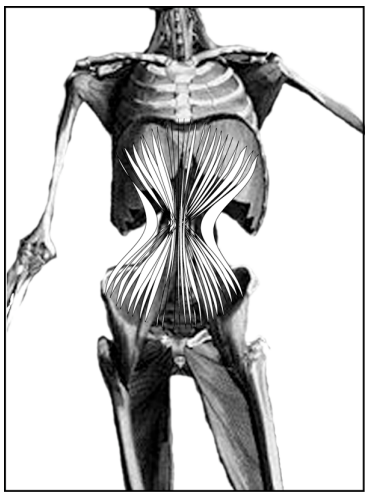

Figure 2. The inner corset stabilizers form a cylinder that lifts and supports the core.

Also of note, it has been found that those with low back pain often have a delay of the stabilizing muscles in movement [50-450 milliseconds]. The global movers are initiating action without the stability of the deep core muscles

first. "The pathology seems to be more a result of inadequate stabilizer function than a problem in the global muscles… Stabilization is pre-movement." [10]

Dr. Rolf addressed the core/sleeve more metaphorically than literally in the sixth and seventh hour.[11] In SNI® we believe that Sessions 4-7 all address the core, metaphorically and literally. What we are looking for in Sessions 4-7 is balance so that all tonic movement support and suspension is optimal.

The Outer Corset—The Sleeve

While the inner corset compresses the abdomen, the outer corset muscles flex, extend, and laterally bend the trunk. At the Rolf Institute®, the outer corset or "sleeve" is held to be "the bounding elements of the visceral space, specifically the ribs and soft tissue of the trunk." [12] They also help us twist and tilt. They include the external obliques, rectus abdominis, psoas major, iliacus, serratus posterior inferior and quadratus lumborum. As phasic muscles, they are more fast-twitch in nature, therefore creating quick bursts of energy. This can be problematic in that their overdevelopment can override the predominantly slow-twitch and often underused muscles of the inner corset, especially the transverse abdominis. And not only is it a developmental difference, but it can be a timing difference as well. If the inner corset muscles don't engage a fraction of a second before the outer corset muscles, then the stability that the transverse abdominis is meant to provide is lost.

Other muscles of the outer corset include the obliques and rectus abdominus. Together, the internal and external obliques wrap the abdominal area in a criss-cross fashion. They sagitally and laterally flex the spine and compress the abdominal cavity. Working unilaterally, the external obliques rotate the trunk to the opposite side, while the internal obliques rotate to the same side. The most superficial layer of muscle is the segmented rectus abdominis; it is responsible for flexion of the spine and can assist in compression of the abdominal contents.

The serratus posterior inferior and the quadratus lumborum are also outer corset muscles worth noting. Both of these muscles attach to at least one of the lower ribs. The serratus posterior inferior moves and stabilizes the ribs. It draws the ribs down and back with the ability to hold the ribs steady against the upward pull of the diaphragm in its resting position or under costal breathing. The quadratus lumborum stabilizes the ribs, holding them down during inhalation. It also has the ability to move the spine and hip. The quadratus lumborum inserts onto the transverse processes of the lumbar vertebrae (L1-L4), and the 12th rib. It is in part responsible for extension and lateral flexion of the lumbar spine, and—if the spine is fixed—it can raise the ilium, as in a hip hike.

The importance of the lumbo-dorsal hinge in structural integration is not new, however recognizing its importance in relationship to the core is worth noting. Dr. Rolf stressed that it is the most important junction to release to achieve freedom of movement. It is understood that the availability of movement at the lumbo-dorsal hinge, and at the dorsal hinge, contributes to full and expansive breathing. Furthermore, balance of the psoas and QL supports integrated movement through the front and back of the body.

As we know, the psoas major is a prime mover of the hip joint. This would classify it as an outer corset muscle. However, it is unique in its diversity of function, which, in the end, makes it both an inner and outer corset muscle. In hip flexion the psoas doesn't shorten, but rather lengthens and eccentrically drops back. It connects our breath and posture. It connects top to bottom. It connects the appendicular to the axial skeleton. It connects inside and outside. It supports lumbar lordosis. It crosses multiple joints. In SNI® we consider the psoas as integral to total core stabilization, connecting Gracovetsky's spinal engine to leg mobility.[13] In SNI® we view the psoas as primary core musculature, and therefore it is addressed in the first session.

Core Issues & Beliefs

"The knowledge of our body is to a great extent dependent upon our actions." [14] If we don't move, then our body has no way of sensing what it is doing. If we become still for a long period of time, we lose the ability to sense where we end and the rest of the world begins, we become one with the outside world. While this can be useful in meditation, it is movement that makes us individuals. Likewise if we don't use certain muscles for a long amount of time or they aren't properly developed, we'll lose the ability to use them. Eventually their individuality, and their ability to balance with other muscles will be lost.

When the inner corset muscles are weak or unable to hold up the body the outer corset muscles, being stronger, tend to pull the chest

and pelvis together, anteriorly or posteriorly. This vertical compression of the visceral balloon, which limits movement of the organs and diaphragm can, over time, alter the function of the internal organs. Furthermore, this vertical compression and restriction of the trunk can create tension on the lower back muscles, which are recruited to compensate for the imbalance of core and sleeve. If the outer corset muscles become overly strengthened in comparison to the inner corset, either an anterior pelvic tilt or posterior pelvic tilt could appear, causing further lumbar back problems. "The whole body is connected, all parts are in relationship. Change in one part changes the whole. When we acknowledge relationship between parts of the body, it makes possible both differentiation of the parts and integration of the whole." [15] Outer corset restriction of the visceral space and problems associated with anterior or posterior pelvic tilt can be a result of muscular imbalance, but they also can originate from dysfunction of the neuromuscular system.

Like all systems and parts of the body, the nervous system, muscular system, and connective tissue are profoundly intertwined to give us our proprioceptive abilities. As we know, muscles and nerves interact and are connected in many ways; in some cases they are ineffectual without the other. Sensory impulses originate from several different sources including touch receptors, muscle spindles, and golgi tendon organs. All of these "sense organs" working together help complete a picture of what the body is doing and how or where it is moving. Proprioception therefore, enables the body to continually sense and adjust.

It becomes clear that a fine amount of involuntary tuning is needed to keep us supported and stabilized. Our muscle spindles and golgi tendon organs are constantly telling us what's happening via their respective reflex arcs. If one part of the system is even a bit off, we can see how it could dramatically affect the timing of the firing of the muscle. "… the whole neuromuscular system works all together, or it does not work at all." [16] We begin to understand the paramount value of the neurological component: "An important part of rehabilitation is to re-establish the appropriate sequence of firing of the muscles: local stabilizers first, global muscles after." [17] By releasing the body through Structural Integration, we are seeking to balance the core and sleeve, and intrinsic and extrinsic, which allows more optimal core/sleeve interactions and therefore neuromuscular interactions.

In addition to the importance of the neurological component in creating muscle balance, we must also recognize the importance of the levels of excitability or resting tension in muscles. Those people considered "up-tight" are generally jumpy and nervous; their resting muscle tension is much higher than someone who is considered "laid-back". This resting tension, although manifested in the muscles, is partially determined by descending impulses from higher brain centers.[18]

Past experiences, trauma, arousal levels, neurosis, mood, and emotional associations can all affect the descending messages to our sensory organs. The muscular resting tension of a person who has just been attacked by a dog is physically higher. They have a keener sense of their surroundings and are ready to react. At the same time someone who has an extremely stressful job will also be more reactive and have a higher muscle resting tension that someone whose job is less stressful. As Juhan puts it, "…objects pull on my muscles from the outside, and my emotions pull on my muscles from the inside; a pull from either vantage point increases the tension on the muscle." [19]

Prolonged high resting tensions result in the muscle "forgetting" how to properly work, how to voluntarily relax. Sensory Motor Amnesia according to Thomas Hannah "…is memory loss of how certain muscle groups feel and how to control them." [20] If we "forget" how to use our inner corset muscles when moving, the outer corset muscles will take over and a cycle of imbalance will begin. Through the sessions and movement re-education we are seeking to bring awareness and support back to muscles that have forgotten how to properly function.

When physical core support is achieved, the balanced resting tension enables emotional balance as well. This is the basis for how and why in SNI® we connect the physical core with the emotional core. "If an individual is motivated, finds purpose in his/her life, and approaches life with confidence and self-esteem, it is both a manifestation of Core Support and an inroad to achieving it. Using Core Support at a body level creates confidence that one can extend into relationship with the world without 'falling apart.'" [21]

Therefore, core imbalance will not just be physical but also psychological; as we free tissue, we free our belief systems. One of the functional

goals of SNI® is to establish a relationship between freeing the body structurally and facilitating an ever-changing interpretation of our core beliefs. This opens the possibility to more flexible adaptation. We encourage clients to re-examine their core beliefs and evolve from the habitual into the expansive and transformative. We understand that release of only the anatomy will not be effective in achieving lasting change. Encouraging an anatomical release is important, but goes much further when clients are also able to release unhealthy beliefs.

While the importance of core muscle engagement is recognized in many other cultures, through their traditional exercise and healing practices, it doesn't seem to have the same emphasis in our culture. And maybe it should. Lower back pain is a huge problem in America; in fact some studies predict that 80% of us will have lower back pain sometime in our lives.[22] It is a leading contributor to missed work, and Americans spend at least $50 billion dollars on low back pain treatment per year.[23] Could this be due to a chronic, nation wide inability to physically relax— a nationwide case of Sensory Motor Amnesia? Or could it be more emotional; could it have to do with epidemic hopelessness and apathy? The thirdchakra, or manipura, is situated at the navel. It is associated with energy and will power, and said to distribute prana, or the life force. It is in many ways similar to the dantian or tan t'ien and hara of Asian traditions. "In the third chakra, the will combines the forces of stillness and movement, earth and water, each shaping the other... Our will combines holding and moving in a way that directs action and shapes our world."[24] It sounds a lot like the core/sleeve relationship, or the cylinder of compression doesn't it? Maybe those ancients were on to something all along.

The author wishes to thank and acknowledge Karen L. Bolesky, Jesse P. Guerrero, and Lanii Chapman whose insights and clarity made this article possible.

Notes

1. Linn, J. 2004. "The Core of the Matter, Core and Sleeve in the Rolfian Paradigm," *IASI Yearbook*, 2004: 105.
2. Bond, M. 2007, *The New Rules of Posture*. Rochester: Healing Arts Press: 93.
3. Newton, A. 2004, "Core stabilization, Core Coordination," 13 October 2009 <http://www.alinenewton.com/pdf-articles/core.htm>
4. Ibid.
5. Ibid.
6. Ibid.
7. Ibid.
8. Bond, M. 2007, *The New Rules of Posture*. Rochester: Healing Arts Press: 94.
9. Hackney, P. 2002, *Making Connections*. New York: Routledge: 75.
10. Newton, A. 2004, "Core stabilization, Core Coordination," 13 October 2009 <http://www.alinenewton.com/pdf-articles/core.htm>
11. Linn, J. 2004. "The Core of the Matter, Core and Sleeve in the Rolfian Paradigm," *IASI Yearbook*, 2004: 108
12. Ibid: 105.
13. Dalton, E. 2008, "Don't Get Married: Part 1", *www.massagetoday.com*, February 2008: 19.
14. Juhan, D. 2003, *Job's Body: A Handbook for Bodywork*, Barrytown: Barrytown/Station Hill Press: 187.
15. Hackney, P. 2002, *Making Connections*, New York: Routledge: 67.
16. Juhan, D. 2003, *Job's Body: A Handbook for Bodywork*, Barrytown: Barrytown/Station Hill Press: 215.
17. Newton, A. 2004, "Core stabilization, Core Coordination," 13 October 2009 <http://www.alinenewton.com/pdf-articles/core.htm>
18. Juhan, D. 2003, *Job's Body: A Handbook for Bodywork*, Barrytown: Barrytown/Station Hill Press.
19. Ibid: 206.
20. Hanna, T. 1988, *Somatics,* Cambridge: Perseus Books: xiii.
21. Hackney, P. 2002, *Making Connections*, New York: Routledge: 81.
22. 2009,"Back Pain Facts & Statistics," www.acatoday.org. 13 October 2009 <http://www.acatoday.org/level2_css.cfm?T1ID=13&T2ID=68>
23. Ibid.
24. Judith, A. 2002, *Wheels of Life: A User's Guide to the Chakra System*, St. Paul: Llewellyn Publications:152.