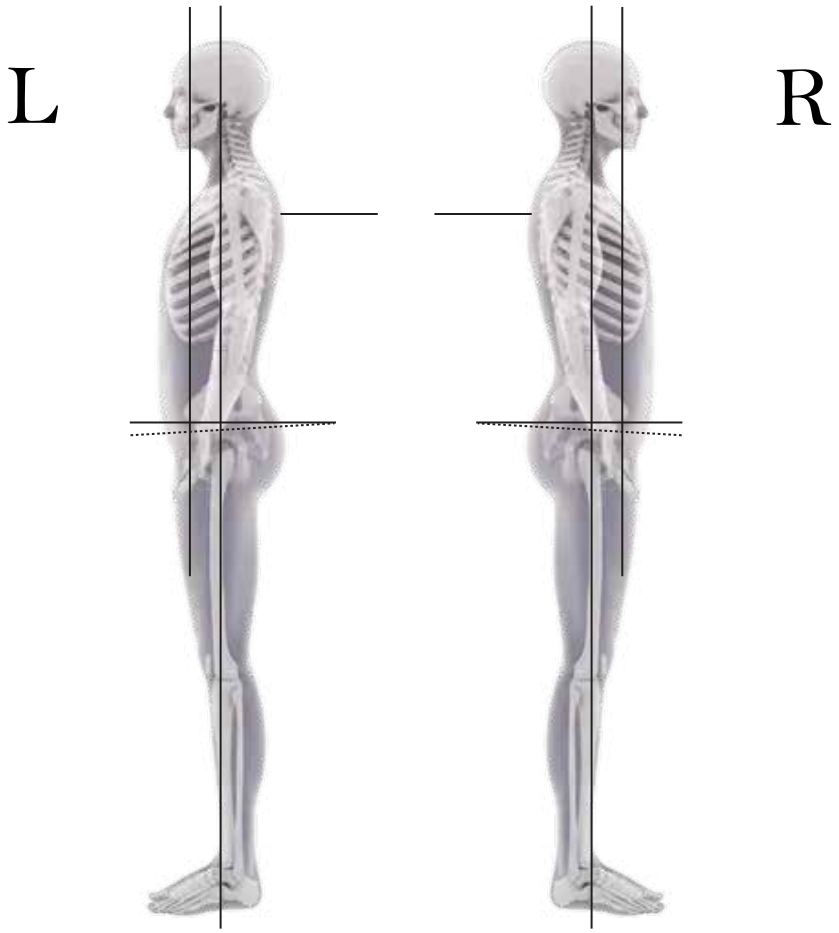
POSTURE AND REHABILITATION

The human body has a finite amount of energy. Although we are capable of great energetic output due to our potential energy storage capability, we are also capable of breaking down, exhibiting poor posture and in need of biomechanical rehabilitation. The need for physical rehabilitation typically stems from a poor posture which may also be directly correlated to a nutrient lacking diet, unhealthy lifestyle or both.

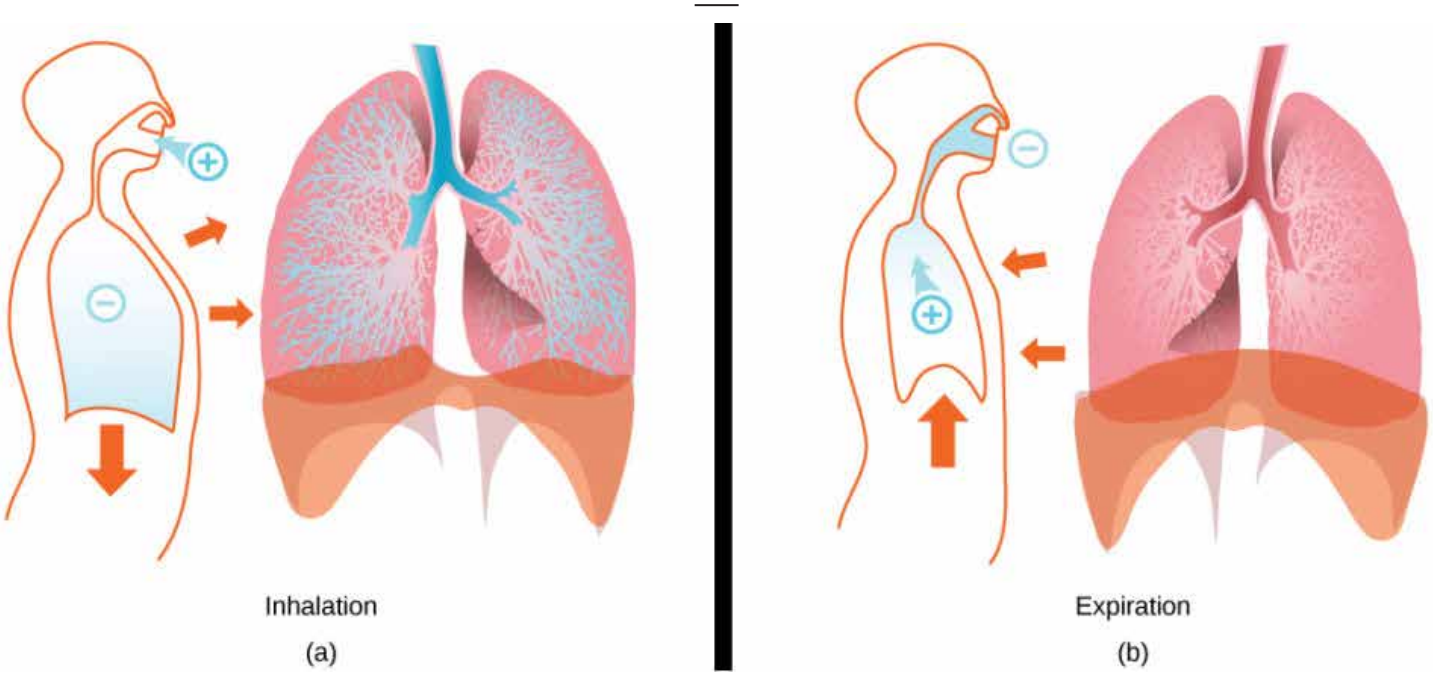
In exercise, it is important to avoid injury by following the progressions of given exercise protocols. Skipping progressions may lead to injury such as faulty motor engram in the muscle tissue, muscle imbalance and inability to properly coordinate muscle pattern recruitment (force-couple mechanisms). In diet, it is dually important to have nutrients that best match and agree with the bodies genetic makeup.

The deterrent to health is to consume artificial and highly processed foods which can lead to physical degeneration of the DNA and body composition. The posture in a depressed person, for example, can lead to a forward positioning of the head and result in an upper crossed syndrome pattern in the superior aspect of the shoulder girdle. Where the thoracic and cervical spines meet is where trigger points, unstable ligamentsand other pain patterns will occur.

Having a conscious awareness of optimal posture will lead a person through the proper phases ofrehabilitation from injury and thus enable freedom of movement in areas of the body which otherwise may have been immobile.



The Diaphragm and Breathing



Let's momentarily look into the client that has a faulty breathing pattern. For a person with a faulty breathing pattern they may have been born with, they will need to be retrained to breathe with the diaphragm. The faulty breathing pattern associated with such a person may have an inability to properly sequence the respiratory muscles which will ultimately put them in a lot of pain. The typical normal breathing test is to place the dominant hand on the belly button with the opposite hand on the upper chest. Upon inhalation the dominant hand should rise first followed by the chest secondarily.

In a person with a faulty breathing pattern the chest will lift first due to a weak diaphragm or nerve innervation of that part of the spine(the phrenic nerve innervates the diaphragm). The client will then need to be taught to activate the diaphragm (having the belly button lift first upon inhalation.) With a faulty breathing pattern only 2/3 of the lungs will fill with oxygen which can deprive the brain of necessary oxygen and open oneself up to infection of the lungs. With a deeply programmed faulty motor engram of the respiratory muscles, the patient will use a lot of his or her consciousness to begin thinking about the proper way of breathing again.

Since they now have to "think about breathing" this can prove exhausting at first due to consciousness overload and may take them several weeks or months to restore proper breathing and conscious functioning as the autonomic nervous system beginsreprogramming itself for optimal function-ability. Harnessing proper breathing mechanics is essential to correct postural functioning and may be an important step in a rehabilitative setting.

It is imperative that you have a functioning respiratory system. It is common in today's world with the various nutrient deficiencies for people to develop upper-respiratory breathing patterns.

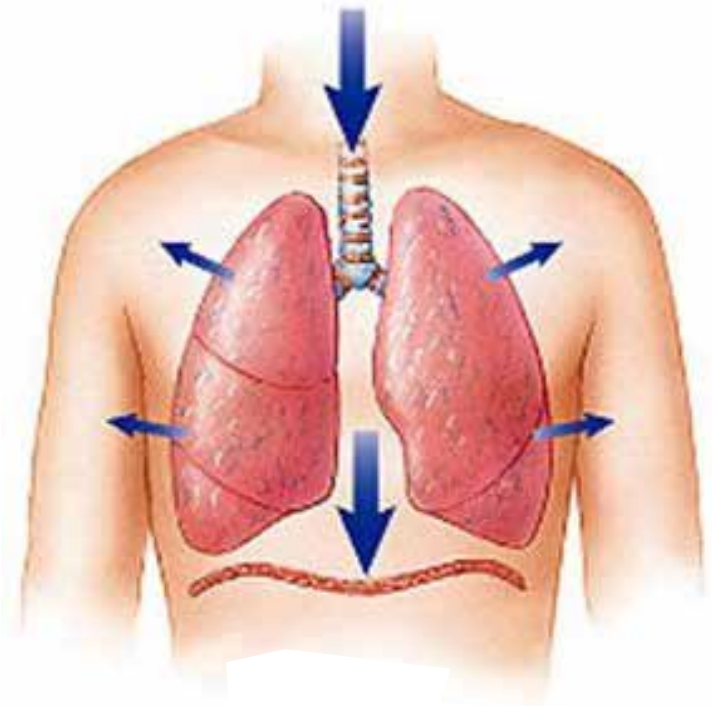
An upper respiratory breathing pattern is backwards breathing. In a dysfunctional breathing sequence people will lift their chest first when they take in a breathe.

In normal breathing, upon inhalation your diaphragm should contract first, expanding your abdomen slightly outward followed by an elevating of the chest second. This fills your lungs full with oxygen and nourishes the brain adequately.

The body works on expansion and contraction. So when you breathe in, everything expands When you breathe out, your belly button should automatically pull slightly toward the spine and all of your muscles would pull together on a microscopic level, otherwise known as contraction.

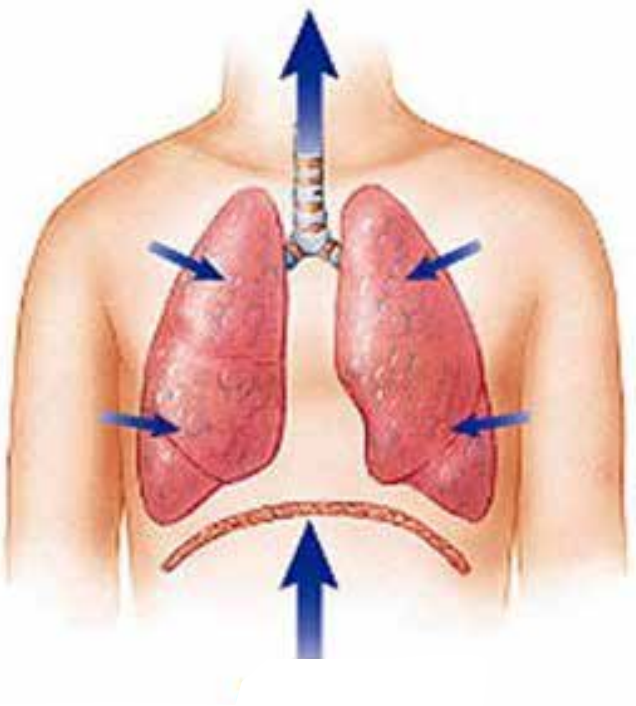
Some people are born perfect breathers while others will have to be re-trained how to breathe with the diaphragm once again. Until rehabilitation protocols have been completed, these people will use slightly more mental energy because it is more of a conscious effort to have to "think about breathing". Stemming from a Medical perspective, a more calming and peaceful lifestyle will suit them best for their healing objectives.

During Inhalation



Diaphram contracts and flattens as the lungs fill up with air.

During Exhalation



Diaphram relaxes and moves upward as the air is released.

Standing

Standing can prove to be quite energetically demanding. Imagine the soldier that has to stand at attention all morning, or the subway business man that stands each morning and afternoon waiting for the train that they then have to do more standing in on the way to work where they may sit or walk all day. Laying down can decompress the vertebrae in the spine whereas standing places pressure on the entire system. Subjecting the human body in an unstable environment is typically regarded as a small threat to the brain. Commonly one will respond to a situation by activating stabilizer muscles that have been inactive and not functioning properly.

In a person with degenerative vertebrae that may be in the form of disc bulges, disc herniations or spondylolisthesis(an anterior protruding vertebra bone) laying down on a couch, bed, floor or other position of comfort can provide temporarily relief from the natural compression that happens duringstanding or walking.

In a study done on Lumbar disc pressures by Nachemson, they compared standing with various other positions of the spine such as crunching, bending over, laying down and sitting. With standing being a neutral 100 they showed that bending forward can raise disc pressure by up to 150 percent and doing a standard floor crunch can raise disc pressure by as much as 210 percent. Even sitting on a chair and bending forward with a weight in the hand can elevate lumbar disc pressure to as much as 275 percent.

The study also showed that when in a supine position (laying on the back) the disc pressure minimized to only 25 percent and laying in a side-lying position minimized to a disc pressure of only 75 percent. This indicates that a spine, if coupled with injury or degeneration, could theoretically be challenged by just standing alone and could increase the likelihood that a person would “sleep in on the weekend” or miss days at being productive in the school or work environment.

With a natural posture, even acute injuries could occur in the normal person who has to bend over to grab a suitcase or even a sock for example. In an already injured individual, this means that their time in rehabilitating their own biomechanics will need to increase due to medical factors indicating the need for less disc compression and more energy conservation.

Some injuries may take weeks or months to rehabilitate whereas others may prove to take years or may be permanent. What is being suggested is that, as an example, if one is so injured to the point that even standing is hurting them, they may need to rest a lot more and be given the optimal nutrient dense foods to bring them out of pain and back into a normal lifestyle.

Good and Bad Posture

Very commonly one can go into almost any gym and see various exercisers performing their exercise routines. Often times, for muscles such as the abdominal wall, exercisers will perform crunches and sit-up style movements. Most of these same exercisers would fail a plum line test if viewed in the sagittal plane.

In a plum line test, the plum line is hung from the ceiling while the client stands next to it.
The line should hold still and should go through the ***lateral malleolus*** of the foot, the ***lateral epicondyle*** of the femur, the ***greater trochanter*** of the femur, the ***greater tubercle*** of the humerus and the ***external auditory meatus*** of the head. In another ideal postural measurement, the tip of the ***zygomatic arch,*** the ***sternal notch*** and the ***pubic symphysis*** should all line up in the same plane.

A poor posture would prove to be less ideal than these alignments in a plum line test. In a typically poor posture the internal organs may be shifted forward inside the body. This may lead to hormonal imbalances, slower healing and development of pain patterns within the body such as low back pain or common hip problems that may carryover into standing or gait (walking).

Poor postures such as head shifted forward, dowagers hump back, anteriorly/posteriorly rotated pelvis, valgus/varus knees(knocked knee and bow legged) and over-pronated feet will almost always lead to the typical pain patterns such as trigger point development, lack of blood flow to certain organs/ tissues, muscle imbalances and impingement of the nerves and energy channels feeding that area of the body. In a standing position, if one or both feet are overly pronated, this may weaken the muscles in the arch of the foot and may cause an acute ankle injury such as a sprain or trail all the way up through the body to create pain patterns in the shoulder girdle/neck region.

In order to create ideal posture it is vitally important to measure yourself if possible or hire a professional that you can go to to measure your posture for you. Of course, if you have a less than ideal posture or even are too injured for exercise, a professional will be able to guide you through the proper rehabilitative process.

An optimal rehabilitative process to correct cases of faulty alignment would include the following: use of the form principle, shortening and strengthening of long weak muscles, stretching short tight muscles and training proper motor engrams into the neuromuscular system.

Hiring a professional kinesiologist to help educate you on postural dysfunctions can prove to be very helpful in the healing process. You may spend countless hours researching the absolute protocols and steps needed to get out of pain or you can just hire a professional and save yourself much trouble in time, research and guessing.

Below are two examples of posture. The left being normal posture and the right being an upper crossed syndrome (forward head posture).

As with any typical good posture, the anatomy model on the left shows a line that goes through the five main measuring points: *lateral malleolus* of the foot, *lateral epicondyle* of the femur, *greater trochanter* of the femur, *greater tubercle* of the humerus and the *external auditory meatus* of the head.

With the typical incorrect posture on the right, you see a rounding of the shoulders and a hyper kyphotic thoracic spine, an anterior placement of the head, a lowering of the chest, an anterior tilt in the pelvis (displayed by the line going downward), a rounding of the lumbar spine and a slight posterior placement of the lower legs and knees.

For optimal thinking and functioning of the mind, the body would have to be corrected towards the posture on the left. The reason for this is because this is the anatomical shape of the body. With rounding of the shoulders and anterior placing of the head there would be a lack of blood flow to the head and the extremities. The blood and internal fluids would instead go toward injury sites on the body and deplete the person's energy much quicker. Therefore, an anatomically correct posture would give a person increased energy, increased mental capacity, disappearances of pain symptoms and overall better performance in their daily living.

The Form Principle

The form principle is a guideline we can use to prevent injury and even rehabilitate our posture from existing or sustained injuries. To better understand the form principle it will help to first and foremost understand that the human body has primal patterns of movement, or, Primal Movement Patterns. Every one of us is capable of using the primal movement patterns and in fact we usually use them on a daily basis in normal living.

The primal movement patterns are the following: push, pull, bend, squat, lunge, twist and gait. This makes for seven movement patterns that the body typically uses in regular living. Let's now go into an example of each one.

Push-ups and bench pressing are examples of the Push pattern. Consequently, bench pressing is not functional whereas doing a push-up may be considered more functional. On a bench press it is common for exercisers to go too heavy which usually results in impingement of the shoulder joints and an overly developed chest musculature with an underdeveloped back musculature. Push-ups and other variations such as standing cable pushes may prove to be more functional due to real-life carryover such as pushing furniture or getting out of bed.

Pulling is the second primal movement pattern we have and we use it a lot more than we know. For example, pulling yourself out of a swimming pool or walking up stairs. While walking up stairs we typically use the side railing and pull ourselves or guide ourselves up the staircase to the next story of a building.

Walking up stairs also involves the lunge pattern. In many situations, young kids like to lunge up the stairs skipping each step because they are so full of youthful energy. Bending and Squat are typically used when we sit in chairs or sit in our car. Sometimes more than one pattern is used at the same time. For example, getting into the car may require a lunge followed by a twist and a bend to get properly situated.

Lastly is the gait pattern. This is simply walking. Many people may not know it, but they have a weak gait pattern. This can be corrected by training the hip flexors to function properly with the abdominal wall musculature. If you have pain patterns in your body, I advise you to assess your gait pattern and see what is causing the dysfunctions to begin the healing and rehabilitative process.

In gyms across America and around the world you can usually see people using all of these primal movement patterns. It is very common, however, to see guys and gals going too heavy with the weight, doing too many repetitions (such as long distance runners) or exercising until they lose form.

To stay within the form principle one would need to stop 1-2 repetitions before form is lost to avoid reinforcing faulty motor patterns and to prevent injury. Some special populations such as the elderly and obese people may not need exercise at all and may just need to go for a walk or do active meditations such as yoga .When rehabilitating and performing special needs training, always progress from most important exercises to least important.

Sensory Motor Amnesia

Lets define a keyword: *Sensory-Motor Amnesia.*

Sensory Motor Amnesia is when the brain forgets how to use specific muscles. Sensory-Motor Amnesia happens when muscle imbalances are present and as a result of pain. Sensory-Motor Amnesia is commonly a result of post-injury or post-surgical pain avoidance. .

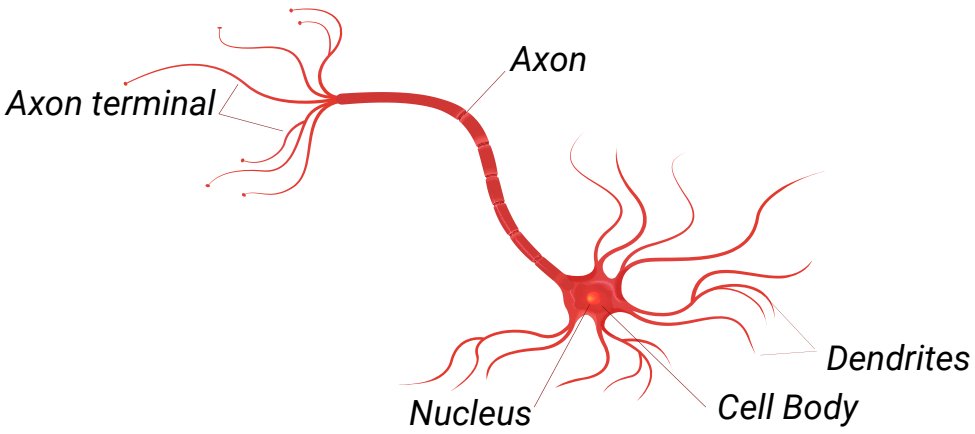
In individuals such as post-surgical clients, they may experience reflex inhibition due to pain, nerve damage or non-activity. This results in an inability to properly recruit certain muscles. The force-couple mechanisms (recruitment pattern of muscle sequences) may be out of balance. This would mean that the individual will need rehabilitation in the form of physical therapy or corrective massage such as neurosomatic therapy.

Sensory-Motor Amnesia is common in those who have been involved in a physical accident such as a person in a car accident. In a car accident involving two cars one of the cars may have had a passenger stop abruptly which would result in a whiplash in the neck and even leave them with psychological trauma such as post-traumatic stress disorder.

In a situation where a person is thrown from the vehicle or a motorbike was involved, the person may of had one or more bones broken, which will result in Sensory - Motor Amnesia in the
muscles surrounding that bone tissue. As an example, someone involved in a motorbike accident may have had a broken femur. This could result in Sensory - Motor Amnesia of the muscles in the leg and put him in the Physical therapy clinic to learn how to walk again.

At the same time, being thrown from a vehicle or a motorbike or being hit by a car can be life threatening and the person may develop post traumatic stress disorder. So the person would not only have to learn how to walk again but they would also have to remember how to live a normal life again after such trauma. Such trauma may detour them from driving vehicles again, or subject them to being in the passenger seat for a while until they are healed.

A patient would need to use both strengthening and balancing exercises to help rehabilitate the righting reflexes and tilting reflexes of the body to reduce sensory-motor amnesia. Righting reflexes are used to keep you upright when you move across a stable object. Tilting reflexes are used to keep you upright on a moving surface. Training righting reflexes would involve exercises that train you on a stable environment such as lunges or doing box step-ups, whereas training tilting reflexes would involve exercising on unstable objects such as a swiss ball or bosu ball.

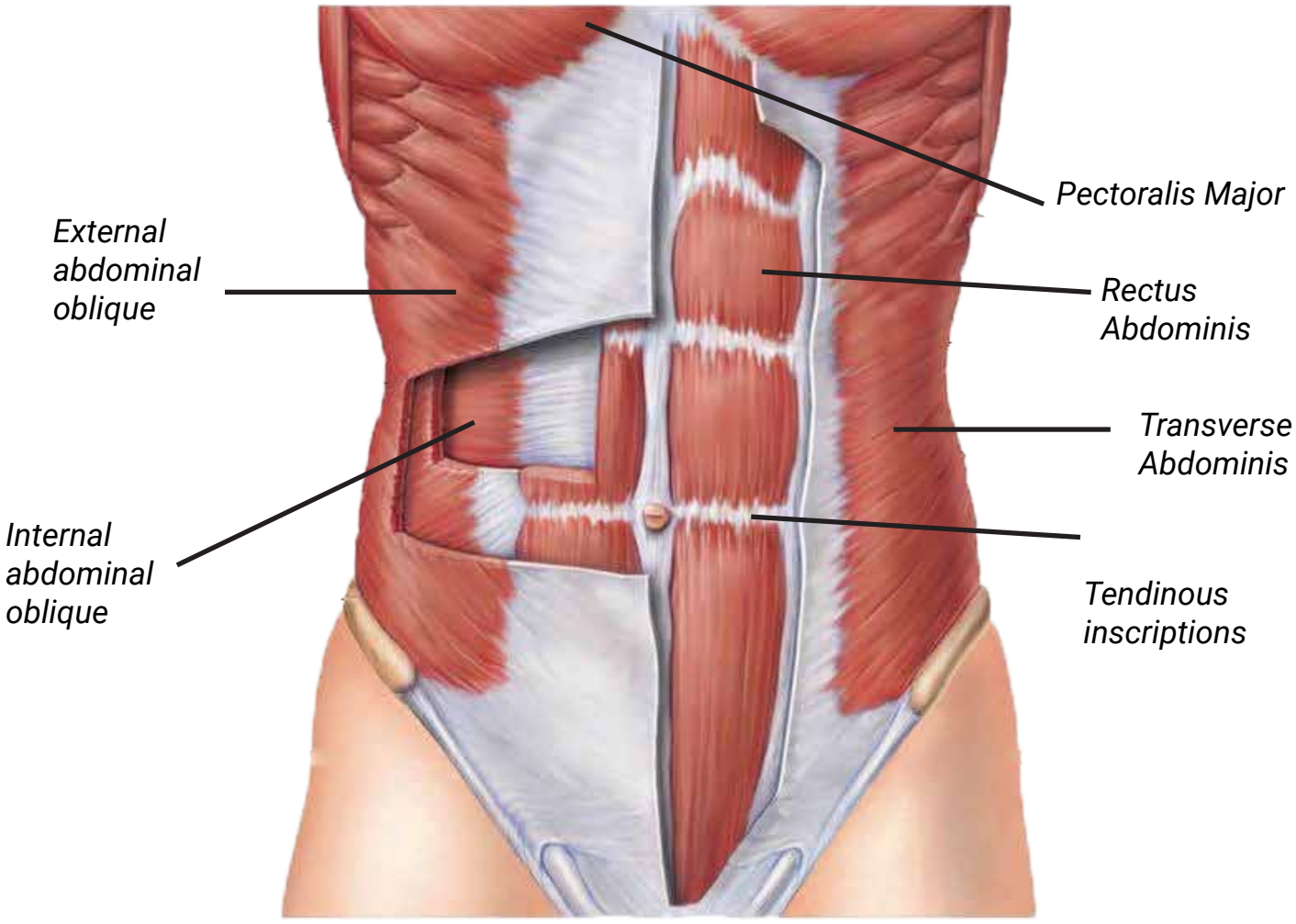


Training the Abdominal Wall

The abs or abdominals are a very commonly worked muscle group on our bodies. However, it is just as common that people train them incorrectly. To start with, the abdominals are the chief stabilizer of the back and spine and therefore need to be trained properly to prevent injury. Most ab routines consist of usually hundreds of situps and crunches. Although this may help someone to "feel the burn" in the abdomen, it is not necessarily "healthy".

After doing hundreds or even thousands of crunches, a person's body may be aesthetically pleasing but it might not be functional. Some people may only get stressed after doing so many crunches or sit-ups and end up becoming even more bloated or feeling less than optimal.

Since the abdominals are a phasic muscle, they like to work with heavier weight and lower repetitions. An example would be doing eight to twelve crunches with a 60 pound dumbbell or weight. The muscle striations in the abdominals are designed for heavier weight and less repetitions, not the other way around, as most would assume.

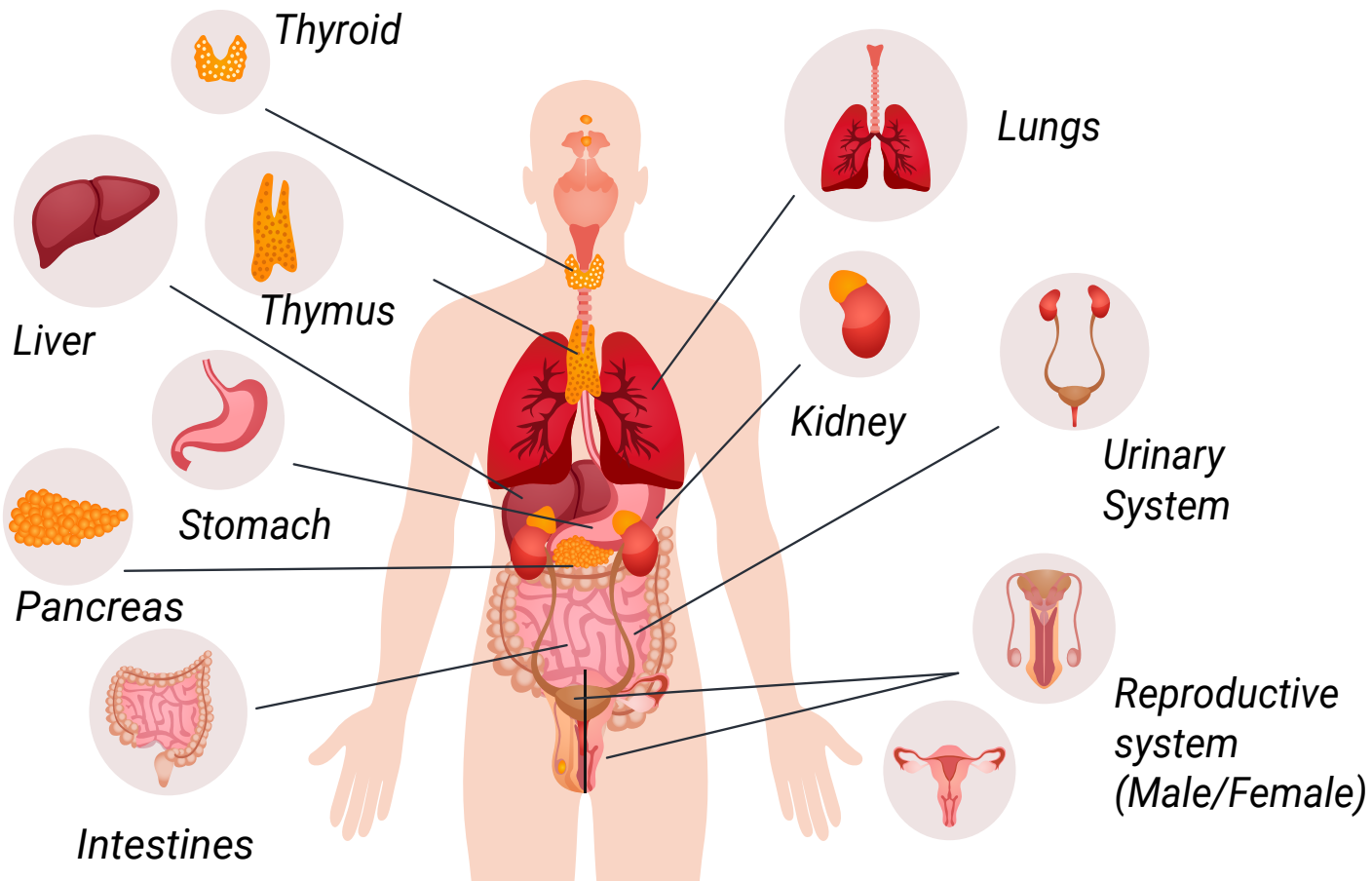


The internal organs

In the origins of bodybuilding there was Eugene Sandow. Although he passed on at an early age from over exerting himself one day, his training techniques can still be applied with great success today. If you look at pictures of early gyms there was dumbbells, barbells, kettlebells, rope climbing, gymnastics, massage, calisthenics and plenty of nutrient dense whole foods. People may have taken cold showers or relaxing baths. They didn't rely on pills, supplements, hormonal trickery or whey protein shakes. There wasn't isolation machines for the chest or elaborate leg-press machines that create knee injuries. Nowadays, with modern science, we can conjure up almost anything that we can think of when it comes to protein isolates, supplement pills and "building more muscle". But does this really work?

It has been said that in order for every muscle in the body to work correctly, one has to have all internal organs functioning properly. So wouldn't it make even more sense to carry over this statement to abdominal work? What organs are in the same neurological loop as the abdominals? All of them! As examples, the kidneys and adrenals are located in the mid back(upper abdomen), the small and large intestines are located in the lower back(lower abdomen) and the liver, spleen, gallbladder and pancreas are in the lower to mid back area as well (middle and obliques).

With that being said, it would make sense then in order to have strong abdominals you would need to concomitantly have healthy internal organs and a smooth flowing digestive system (just for starters). We cant discount brain health either, as that organ is like the government of the body. Since the heart is like a pump for the body it also makes sense to regularly participate in cardio work. Find the foods that heal and detox your organs and you will be on the way to having a healthy core and abdominal musculature.



Transversus Abdominis

When you do crunches or other abdominal work, your body will breathe in as you extend back into a position where a sit-up or crunch can be initiated from. When you perform a crunch, reverse crunch, sit-up, or other contraction, the body has a natural tendency to exhale as the belly button is pulled toward the spine to activate the transversus abdominis.

Have you ever seen a bodybuilder with a weight belt around his or her waist? What about a truck driver or furniture mover with a back brace around the waist or low back? The bodybuilder typically wears the weight belt because they think it is making them lift heavier weights. They think it is making them stronger. The furniture mover might wear aback brace because he injured his back and the abdominal wall became weak or inactive. Either way, both are displaying symptoms of a weak abdominal wall and need to be rehabilitated.

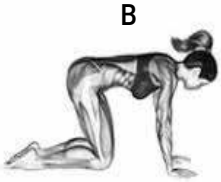
In common scenarios, the bodybuilder may have taken supplements or even steroids and shutdown their natural hormonal production. This weight belt they use to “lift heavier weights” is actually damaging them more than anything because they typically will push their belly button against the belt, totally deactivating the transversus abdominis and stabilizing muscles of the spine. In a truck driver or furniture mover, typically they may have eaten wrong and didn't use proper body mechanics. Maybe they aren't hydrated enough. So after moving enough desks around eventually their back goes out and they wind up putting on a back brace.

To naturally stabilize the back you need to do two things. First and foremost eat right for your metabolic type and individual needs. If your genetics and DNA don't agree with it, then don't put it in your body. The next thing is to learn about and train your transversus abdominis to begin rebuilding the abdominal wall and it's inherent stabilizer mechanisms.

Activating your transversus abdominis is easy, just pull your belly button slightly toward your spine. There, now it's activated. The trick is to hold that position automatically while you breathe, exercise, go through daily living, etc. Since the transversus abdominis is the first muscle that is supposed to activate prior to any other muscle, it is vitally important that it be functioning correctly.

A

B



In the picture to the left you see an exercise for training the transversus abdominis.

A. The stomach is relaxed and the transversus abominis is inactive.

B. The belly button is pulled toward the spine, activating the transversus abdominis, the body's natural weight belt.

Hold the umbilicus against the spine for ten seconds. Relax for ten seconds and repeat ten times.

Sequencing Ab-Work

In training the abdominals it is best to train them in a specific order for optimal results.The order for training the abs is the following: first lower abs, second obliques (side), third upper abs. Since there is an attachment to the pubic symphysis, it is best to start training the lower abdominals first followed by the side and upper. This optimizes stabilization of the legs and hip in relationship to the spine.

An abdominal routine can also be split into a few days or it can be done all in one workout. For example, you can do the lower abs monday, side abs wednesday and upper abs friday(or other days of the week).You can also just do the whole abdominal complex in one workout. Starting with reverse crunches and hip stabilizing exercises to then progress into functional oblique training and upper abdominal training

The phasic nature of the fibers in the abs make them perfect for heavier weights and lower repetitions. When hundreds of crunches or a thousand sit-ups are done, the abdomen typically goes into a spasm. It might not seem like it though because of the amount of aesthetically pleasing natures surrounding these muscles by our culture. Attention is taken away from simple ailments and brought to the "best looking abs" in the gym. But, would you rather be sick and have the best looking abs or be functional, more energetic and still have the best looking abs?

Functionability is our goal. If your abs don't have functionability they lack the ability to function in extreme stress situations. Since the spine moves in three planes of motion (the sagittal, frontal and transverse planes) it makes sense to work the lower, sides and upper abdominals in a workout. If all you're doing is a thousand crunches and reverse crunches you are literally working the abs backwards and in only one plane of motion, the sagittal plane (a crunch or sit-up). With so much contracting going on in this muscle it will eventually become short and tight and pull the manubrium and xiphoid process down(two bony landmarks on the sternum). With the sternum now pulled down the chest compresses and the back rounds forward, positioning the head in an upper crossed syndrome (the common forward head posture).

A forward head posture will create stress on the joints and ligaments in the neck, stress on the posterior(back) muscles of the head and neck and will also cause dysfunctions in breathing. If you are already a perfect diaphragmatic breather but still have the forward head posture from too much abdominal tightening, your body may still get a fight or flight"stress response" as if it is in danger due to improper body mechanics. This can lead to hormonal fluctuations or other issues such as pain patterns developing in the body. All of these issues can be avoided by simply stretching the tight abdomen and strengthening the back extensors.

It is interesting to note that the sagittal plane of motion is also the most difficult plane of motion for the body to function in. Considering the factor that we live in a 3-dimensional world (we walk around on a gigantic sphere called Earth) we will also need our joints, ligaments and bones to be stabilized in the other two planes of motion. It is equally important to work our oblique abdominals in standing positions and other functional positions just as we work the standard rectus abdominis.

Spinal Stability

On a deeper level, there are several stabilization muscles that go up and down the spine that prevent too much flexion, too much extension, too much torque and injury. These muscles are much smaller than the standard three abdominal muscles (lower, middle, upper) and they span from vertebra to vertebra.

Spinal stabilizing muscles include: the ***multifidus, interspinales, rotatores, intertransversarii, semispinalis, spinalis, iliocostalis, Longissimus, iliopsoas, quadratus lumborum and latissimus dorsi.***

For simplification: the ***intertransversarii, rotatores, multifidus*** and ***semispinalis*** have the most part in stabilization of the vertebrae themselves and prevention of excessive torque.

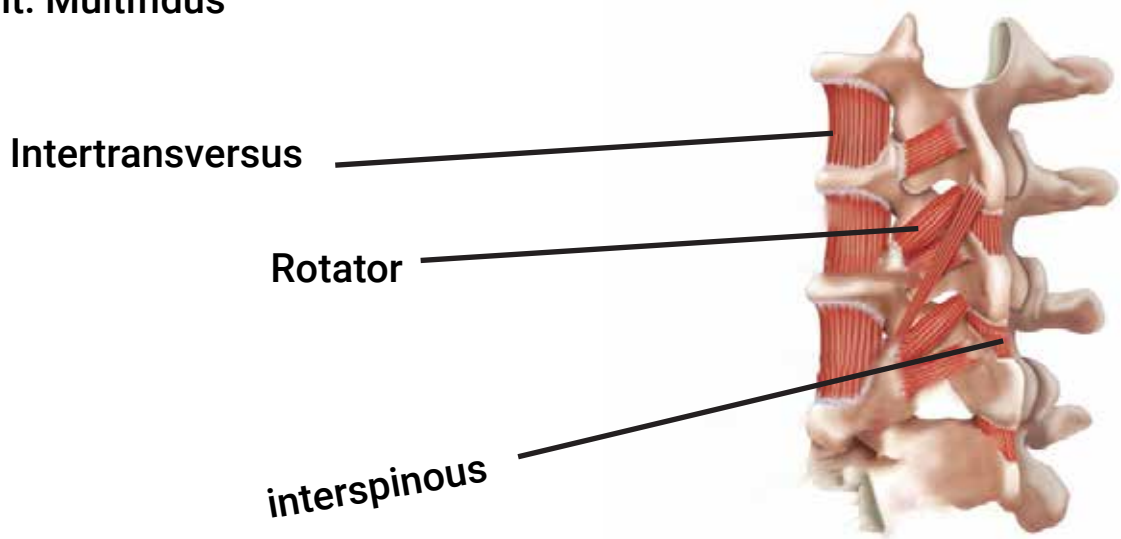
If someone has weak spinal muscles or back pain issues, exercises can be done to strengthen the ***multifidus, intertransversarii and rotatores.*** With these three muscles (or more) trained and strengthened one can show that you can adjust the spine on its own.

You can alleviate back pain and move discs back into alignment by strengthening the proper muscles of the spine itself. Doing this will eliminate the need to take certain pain medications that have side effects and risks that outweigh the benefits.

Once you are in natural spinal alignment using your own musculature, you can begin living a normal pain free life again. Even if you have permanent injuries/dis-abilities, you can still benefit to a great degree by strengthening the spine and core musculature.

Our brains have a natural tendency to migrate to what feels better and if you can strengthen the proper core muscles to better function in the three dimensional world they are designed for, you are inevitably going to rebuild your health from the ground up. Our body has the ability to produce its own pain relievers such as endorphins which will additionally have the potential for eliminating the need for dangerous drugs.

Left: Rotatores, Intertransversarii, Interspinales
Right: Multifidus



Normal Considerations

The reason we look at our health in this article in the aspect of posture is because when viewing the body in a postural assessment we are looking at it in a static position and static postural dysfunction is usually the result of an injury, pain or poor postural habits in the lifestyle.

Static postural dysfunction leads to dynamic postural dysfunction and opens us up to the possibility of overall structural dysfunction. This is when we repeatedly perform the same exercise incorrectly. Thus, focusing on the form principle and keeping good form is to maintain optimal dynamic posture and prevent injury in exercise or day to day activity

We want our neuro-motor skill to be proficient in both static and dynamic postures for optimal health and performance. To prevent revisiting a rehabilitative setting it will be necessary to create a maintenance program for yourself and for your individual needs.

As always, preventing insomnia and adhering to the protocols for measuring posture will lead to typical case studies and help prevent scenarios that abate normalcy. In functioning through the best postures, your health will hopefully evolve out of a rehabilitative setting. Using holistic methods, you will likely characterize optimal health and performance within yourself to become increasingly pain free and disease free.

To conclude, we want to be sure that we are breathing correctly, standing in correct postural alignment when possible, observing the difference between good and bad posture, using the form principle and maintaining our self educated stand point of the aforementioned for optimum health and performance.