

**ABOUT YOUR MUSCLES:
WHAT YOU MAY NOT KNOW ~ AND WHY IT MATTERS**



NeuroSoma® Muscle Therapy

**By Tamsin Stewart
Well Being LLC
434-985-1213
www.neurosoma.com
info@neurosoma.com**

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By Tamsin Stewart, *NeuroSoma*® Muscle Therapist



This article is intended to empower you to greater self-reliance when looking for answers to your health problems, and to shed light on a specific malfunction of a body system that impacts many other body systems, and affects many if not all people at some point in their lives, but nevertheless is overlooked by doctors and alternative therapists alike.

Although approximately 50% of your body mass is skeletal muscle, no doctor specializes in this system. Anesthesiologists, dermatologists, psychiatrists, ophthalmologists, otorhinolaryngologists, cardiologists, radiologists, internists, neurologists, orthopedists, surgeons, pathologists, pediatricians, proctologists, physiatrists, GPs, and sports medicine doctors abound. I have yet to meet a myologist, or muscle doctor. A skeletal muscle specialist would have to roll up his or her sleeves, palpate, and use hands instead of pills, scalpels, or injections.

Humans (primates) have 3 types of muscle: [1] Cardiac or heart muscle pumps blood through the arteries and veins, and [2] smooth muscle lines the walls of vessels, hollow organs, and reproductive and digestive tracts. Both smooth and cardiac muscle contract only ‘involuntarily’ ~ beyond our conscious control. [3] Skeletal muscle is the skinny or plump little self you know as you; it contracts both ‘voluntarily’ and ‘involuntarily’.

All 3 types of muscle have only 2 jobs: contract and relax; and all 3 types *need* to relax between each contraction. The heart contracts, and relaxes; the diaphragm contracts (flattens) as we inhale, and relaxes as we exhale. The intestine contracts and relaxes, moving food and waste to its ultimate destination. Skeletal muscle, well, because it’s voluntarily contracted, we can contract and hold and contract more, and hold more, and so on without allowing it to relax between contractions; and we often do just that.

But in order to stay healthy, skeletal muscle needs to relax after every contraction. The capillaries deliver fresh arterial blood containing oxygen and nutrients to the muscle, and exchange them in the cells for carbon dioxide and metabolic waste, hence becoming venous blood. Because many skeletal muscles close like fists around their tiny blood vessels during contraction, waste products can be removed *only* when these muscles relax; therefore, each contraction should be immediately followed by a full relaxation in order to clear the muscle of waste. Things start to go wrong in the muscles when this doesn’t happen, and this is partly what doctors don’t understand.

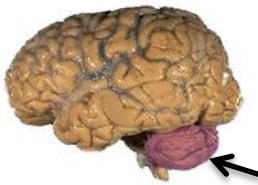
Of course doctors do understand the complicated process of skeletal muscle contraction, and they know which muscles attach to which bones and how each muscle positions each bone upon contraction. But they are typically not trained to know how muscle *malfunctions*, or even acknowledge that it can and usually does malfunction, by permanently, *automatically* contracting to the point that it impinges on nerves, squeezes joints together, cuts off circulation, and even disturbs body chemistry.

Structure vs. Function: doctors tend to focus more on mal-structure than mal-function. But just as the functional horse moves the structural cart, functional muscle *moves* structural bones, and is responsible for how tightly the end of one bone abuts the end of another, and for how the bones & joints move. In fact, chances are good that whenever knee, shoulder, hip, or spinal joints have problems, spastic muscle is responsible. The malfunction of spastic muscle is creating the malstructure of torn menisci and herniated discs.



Muscle determines how we look, feel, and move. It doesn't just move our bones and hold our joints together, skeletal muscle also produces and uses most of our body heat, produces and uses most of our energy, helps circulate our blood, cushions our nerves, and allows us to walk, talk and interact with our environment. It largely determines our appearance, our movement, and even our speech. Partnering with the muscles are their tendons.

The elastic partnership that holds joints together: although it's commonly believed that ligaments hold joints together, in fact the muscle-tendon unit is primarily responsible for joint integrity, with ligaments acting as backup. In order to do the job however, muscle-tendons must receive a tiny but steady amount of *automatic contraction*, known as "muscle tone". The "little brain" supplies this automatic contraction.



Remember, we Have Two Brains: The cerebrum is the big thinking brain that fires nerves to contract muscles when we want to move; it becomes more and more wrinkled as it forms new neural pathways with new ideas. But the little cerebellum underneath the cerebrum is fully formed when we're born; it comes pre-wrinkled, with most of its synapses in place and its instructions pre-wired. The cerebrum has many jobs, and one of them is to *automatically* contract a few fibers in every muscle all of the time.

Voluntary and Involuntary Contraction: The first thing Wikipedia says about skeletal muscle is that it is *voluntarily* contracted: we have to consciously think about moving before the cerebrum fires neurons into muscles to cause their fibers to contract (shorten) enough to move the bones to which the muscle's tendons are attached. Less well known is that skeletal muscle is also contracted *involuntarily*, or automatically, and here's where it gets interesting.

Muscle tone is defined as "the amount of contraction remaining in a resting muscle". It is this constant, automatic, *static* muscle contraction that keeps us from sliding out of joint and keeps us erect against gravity. An electromyograph, or EMG can't measure muscle tone as spikes of activity, but picks it up as background noise because it is static; a constant, smooth and balanced contraction. One fiber contracts for a fraction of a second, and as it lets go, another steps in to take its place.

As just discussed, the cerebellum is programmed to maintain this low level of contraction in all your muscles all of the time. But how does the brain know if the contraction it creates in each muscle is too much or not enough for proper, low-level muscle tone? It depends on information received from little nerve centers, or nerve bodies called *muscle spindles* scattered throughout every muscle.

Muscle spindles: how muscles talk to the cerebellum. Spindle nerve bodies have a number of jobs, including initiation of the powerful, automatic muscle contraction known as the *stretch reflex mechanism* (discussed next month) using “feed forward” nerves whenever they sense the muscle is being stretched. But the spindles’ primary job is to monitor their section of muscle *for the amount of tension or stretch that section is enduring*, and then report that information through specialized “feedback” nerves traveling from spindles directly to the cerebellum. The brain monitors those reports and responds by either contracting more or fewer fibers in the muscle, thereby maintaining proper muscle tone. Remember, we’re not consciously aware of this *automatic* contraction.



Think of the muscle spindles as US soldiers dug into an Afghani hillside, relying on walkie-talkies to inform headquarters of their location and status; if the communication system fails, headquarters might lose sight of those troops, or even attack them by mistake. Our spindle feedback nerves are our walkie-talkies, but as we are currently evolved, a far-too-common glitch exists in this feedback system that fools the cerebellum into believing it isn’t contracting enough fibers to do the job properly; so the brain contracts more fibers in that muscle.

This malfunction occurs when circulation is impeded and an overload of the metabolic by-product lactic acid collects in a muscle. When a muscle is injured, underused, or not allowed to relax between contractions, circulation slows down; lactic acid can then collect in that muscle and can potentially reach a concentration level where it moves into and becomes trapped in the spindle nerve bodies. There it sickens their delicate feedback nerves to the cerebellum, weakening and distorting their signals; this sets up a vicious cycle.

Programmed to receive signals of a certain strength to verify it is producing the correct amount of muscle tone, the brain contracts more fibers in an attempt to rectify what it perceives as too little automatic contraction. The increased contraction produces more lactic acid and simultaneously squeezes off tiny veins within the muscle, reducing circulation and concentrating more acid in the muscle and spindle, where it further sickens the feedback nerves and a vicious cycle ensues. This situation is permanent unless treated, and as you can see, this doesn’t bode well.

This is the muscle malfunction that most doctors don’t recognize. They often attribute the widespread and dire results of this ever-encroaching, incessant hardening of muscle tissue to problems in bones, nerves, or other systems. Then you are told your shoulder, hip or back needs surgery, traction, steroid injections, or physical therapy – which usually includes exercise to strengthen the muscle. The muscle doesn’t need strengthening; it needs for the brain to *allow it to relax*. And because it’s an inside job between the spindles and the brain, working directly on the muscle cannot correct the malfunctioning nervous system that has run amok.

The good news is that it is almost never too late to heal your muscles.

➤ **TO BRIEFLY RECAP:**

What Causes Your Pain?

One of the cerebellum's primary jobs is to provide a constant, low level of automatic contraction in all skeletal muscle so as to maintain joint integrity and posture. In order to do so, your 'little' brain relies on information sent to it through tiny feedback nerves traveling in from nerve bodies located out in muscles; these nerve bodies monitor muscle tension, and then report to the brain through their feedback nerves. But a sluggish or constricted blood flow can allow a metabolic waste product to concentrate in muscles to the degree that it spills over and invades the monitoring nerve bodies (known as muscle spindles) where the acid sickens their little feedback nerves, whose signals to the brain become weak and distorted.

These weak signals lead the cerebellum to believe it must ramp up more automatic contraction ~ i.e. enlist more fibers within the muscle in an attempt to reach the brain's 'set point', get the signal it is looking for from the feedback nerves. A vicious cycle sets in: more contraction creates less circulation and produces more metabolic waste, so feedback is further weakened, making the cerebellum call for more contraction. Eventually the muscle becomes spastic ~ in some cases hard as granite ~ a condition that is permanent unless treated. Due to the body's ability to produce *endorphin* (internal morphine), the overly contracted muscle may or may not be in discernible pain; but inevitably, physical problems, ranging from premature aging to chronic pain to real illness, will result.

- **NOW we look more closely at *lactic acid*, this toxic (to the feedback nerves) metabolic waste product, at real physical problems that can result when it concentrates in the muscles, and learn why this nerve and muscle malfunction is 'insidious', silently creeping in stealthy progression.**

Exactly What IS Lactic Acid? Think of carbon monoxide exiting your automobile's tailpipe: the toxic waste produced from the combustion of gasoline and oxygen must be removed from the engine through the tailpipe. Lactic acid is toxic waste produced during your body's energy combustion of glucose and oxygen; it must be removed through the veins to the liver. You certainly don't want to block your car's tailpipe with a baked potato any more than you want to block your veins carrying lactic acid out of your muscles. But that's exactly what happens when muscles are overstretched and/or held in static stretch, injured, overused (i.e. too many repetitions of any contraction with not enough rest time between contractions; running long distances), or underused (yes, couch potatoes get spastic too).

Quick Lesson on Metabolism, or What Happens to Your Dinner: your mouth, stomach and small intestine digest the broccoli into a potent liquid broth of nutrients that is then absorbed into the bloodstream through the walls of the small intestine and taken to the liver, which processes the nutrients and sends them on in the bloodstream to the heart. The heart mixes the enriched blood with oxygen from the lungs, then pumps that oxygen and nutrient-rich blood throughout your body, where it passes through the walls of every cell you own, from toenail to eyeball. Our cells can't use the broccoli nutrients, they can only use a specific form of *energy* called *ATP*; and so each cell processes these nutrients into energy in millions of *chemical reactions* known as the *metabolism*. Like any other processing plant, waste products result from this process, and lactic acid is muscle metabolic waste that must be removed via tiny veins within the muscle. Otherwise it concentrates in the muscle, overflows into the spindles, and sickens their little feedback

nerves to the cerebellum. Then the brain contracts more fibers, your muscles get harder, and now you have a bad back, stiff knee, headache, or worse.

It's Not Due To Lack Of Oxygen, But To Lack Of Circulation: Most resources say that lactic acid builds up and concentrates in a muscle when there isn't enough oxygen to process it; but it's actually more about lack of circulation in the muscle than lack of oxygen. When many – not all, but many – muscles contract, they close like fists around their tiny veins and can stop venous blood from being removed from the muscle for *as long as the muscle remains contracted*; this includes one long contraction, or repetitions of contraction not interspersed with relaxation. The damage happens when the contracting muscle doesn't allow enough blood flow in the tiny capillaries and venules to get that acid out of the muscle. The result? Hard, painful muscles caught in hypertonic spasm.

Conventional thinking says no permanent harm is done to the muscle if lactic acid reaches concentration levels high enough to stop the process of contraction; that as soon as circulation is restored, it will remove the acid, and all will be as before. But most current research does not consider the potential damage to the spindle nerve bodies scattered throughout the muscle, or what happens to their delicate feedback nerves if they become inundated with lactic acid. There is even wide disagreement about the whole system of muscle tone and about which nerves attach to which spindle fibers. But remember, there are no doctors for muscle, so the entire system is glossed over and to some extent, neglected.

If You Ask 10 People If They Have A Muscle Problem, 8 Of Them Will Say Yes; and if they saw a doctor, they were likely given either a steroid injection, muscle relaxers or pain pills, told to stay off the muscle, or sent to physical therapy to 'strengthen' their muscles through exercise (thereby increasing contraction). In most cases, the primary fix is to numb the pain resulting from the malfunction. But pain is simply a messenger, and killing the messenger does not address the problem, which quietly, insidiously continues to grow in this vicious, ongoing cycle of malfunction. Multitudes of unnecessary surgeries are performed for shoulder, hip, knee, and back problems.

On December 26, 2013, the New England Journal of Medicine published a research study suggesting that improvements in knee pain following a common orthopedic procedure to repair a torn meniscus appeared to be largely due to the placebo effect. Mounting evidence suggests that the procedure doesn't work, and that fake surgeries produced equivalent results to real surgeries in terms of customer satisfaction. This is just one type of minor surgery, but many if not most orthopedic surgeries could be avoided if the muscles had been kept healthy, for example through regular walking or hands-on stimulation of nerve feedback (more on that later).

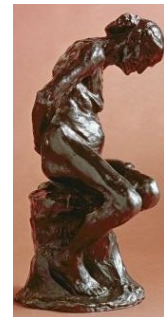
Muscle Contraction Often Presents As Other Common Ailments And Diseases. We begin life with healthy, plump muscles able to contract *and relax*; but with enough abuse, injury, and underuse, we can end up with hard, painful muscles that pull us into old age. This vicious cycle of ever-weakening nerve feedback leading to ever-increasing over-contraction of the muscle creates joint pressure, pulls joints out of alignment, smashes nerves, and restricts circulation. Hypertonic muscle can result in conditions as diverse as neck & back pain, herniated discs, sinus problems, hip & knee pain, what is called 'torn' rotator cuff pain, restless legs, dizziness, constipation, indigestion, and can absolutely exacerbate most symptoms of auto-immune disease.

But Why Don't We Feel This Happening? The answer is endorphin, which again, actually means 'internal morphine'. Our brains produce endorphin to mask pain. The more contracted we become, the more pain we feel, the more endorphin is produced. Sometimes it's enough to wall off the pain entirely except for periods of time when a new nerve or muscle is encroached upon, and then we say our back went out, or we have bursitis or rotator cuff problems. Eventually the pain might subside completely, but now our range of motion is limited. The body of our youth ~ agile, plump muscle, smooth facial tissue, supple joints ~ disappears. Because the malfunction is not in the muscle itself, but in that delicate little nerve feedback running from spindle to brain, it cannot be addressed by working on the muscle itself. Mash and stretch as you like, it only makes matters worse by activating the dynamic *stretch reflex mechanism* that automatically and powerfully contracts the muscle in order to protect it (discussed in the final part of this series).

How do you know if your muscles are hypertonic? You can't always tell by its appearance if a muscle is caught up in the cycle of hypertone; a more reliable gauge is how painful and/or hard they are to the touch. The fact is that almost everyone has some hypertonic muscle. If for example you have tight shoulders, hard calves, painful joints, or constant post-nasal drip, you probably have some hypertonic muscle.



What do hypertonic muscles look like? Although they don't have to bulge like those of Mr. Universe of 2009, Ron Coleman's muscles *are* hypertonic, and would definitely feel hard to the touch. But chances are that sculptor Rodin's elderly woman also has hypertonic muscle; don't let her thinness or sagging fool you. Beneath flab often lies contracted muscles; the flesh overlying deep spastic muscle is starved for blood, oxygen, and nutrients, and can appear saggy and soft. Additionally, hypertonus bends the skeleton



into the stiffness of old age. Treating spasm often restores firmness to overlying flab and allows normal posture and alignment.

- **SO FAR WE HAVE** discussed various aspects of skeletal muscle, including the fact that it is contracted both willfully (voluntarily) and automatically (involuntarily), and examined a common malfunction of hypertonic muscle (how muscle gets hard & spastic) that can result from concentration of lactic acid in the muscles. Some of the physical complications that result from that malfunction were discussed, as was the concept that the condition evolves through a stealthy encroachment of muscle tissue as the brain recruits more and more of the muscle's fibers into automatic contraction.
- **NOW WE FOCUS ON HEALTHY MUSCLES** ~ how they can be restored to pain-free movement and strength, and how to prevent future damage and maintain your youthfulness well into old age. It also covers what constitutes excess muscle tone, and sheds light on a body mechanism that is meant to protect muscles from being overstretched, but instead throws them into contraction if ignored.

What are mainstream remedies for spastic, painful muscle? Steroid injections, muscle relaxant drugs, exercise to strengthen muscles (which increases contraction), surgery, or alternative techniques that deal directly with the muscle; all focus on eliminating pain rather than on the cause of pain. *Pain is a messenger, and we need to listen to the message rather than kill the messenger.* They can all help, but relief is often temporary, because these methods release endorphin, paralyze muscles, increase or inhibit contraction, interrupt nerve function, or suppress the immune system and drive the problem deeper into the body. Surgery can have dire ramifications; it always leaves the initiating muscle problem intact but can damage nerves so they no longer carry the message.

Two therapeutic techniques widely employed, either singly or in some combination, are 1) static stretching to lengthen muscles and 2) direct pressure to soften muscles. Unfortunately, both increase muscle contraction, hence increase pain and subsequent endorphin flow.

- **Static stretch, or stretch & hold (also stretching too far) activates the powerful myotatic stretch reflex**, a well-known but widely ignored, automatic contraction of muscle tissue. [Wikipedia – see *Stretch reflex*]. This increased muscle contraction also increases pain, therefore causing endorphin release.
- **Pressing deeply into muscle tissue will also cause the muscle to automatically contract** in a stretch reflex response. You may not feel the contraction, and a large portion of your muscle fibers (the fast twitch) may seem to relax; but in reality they've simply reached their point of exhaustion, and can no longer contract until they recover. But by then the area has been pumped full of that internal morphine to numb the pain produced by the contraction.

Stretching correctly: Gentle stretching with continuous movement is beneficial to muscles and circulation. Stretch to the point of strain, but don't pause there, just return to neutral in one smooth movement. Repeat as many times as you like. Colorado stretching guru Bob Anderson says, "Stretching should be as relaxed and natural as a yawn".

Returning muscles to health: First remember you can't attack the muscle, because the muscle is not only working, it's overworking! Your goal is to allow the muscles to relax, and to do so, you must get into the nerve feedback system that has run amok. Second, the process of re-establishing nerve feedback in tight, contracted muscles not only allows your brain to see the full extent of the problem, but also allows the owner of those muscles to *experience* their true condition. You know now that hypertonic, spastic muscle tissue is often numbed-out by endorphin to some extent, and stimulating the feedback circuitry wakes them up; waking up a painful muscle can be painful. And third, this accumulation of layer-upon-layer of spastic, hard muscle has taken time to develop, and it will take time to undo. The healing process also has to happen in layers, and the speed of healing depends on 1) the extent of the problem: how many muscles are involved in the pattern? 2) the age of the spasms: did it start when you fell out of the apple tree when you were six?, and 3) the genetic speed of your nervous system, which varies in everyone.

Get the brain involved. The process involves stimulating the specific flower-spray nerve feedback to the cerebellum, which allows the brain to see what's going on in the muscle; and once that diligent little brain gets an accurate picture of the true condition it has created, the brain itself starts to relax the muscle, and the body heals itself. This is **NeuroSoma®** Muscle Therapy. The stroke across the fibers must be long enough to activate as many of the motor units as possible, but with a pressure light enough to avoid stimulating the annulospiral nerve endings that activate the stretch reflex (they also ensue

from the muscle spindle, so it's a matter of slipping under the annulospirals to stimulate the flower sprays to the cerebellum). Remember that even though the pressure is very light as compared to most massage techniques, it can feel very deep because it works directly in the nervous system. Learning the *NeuroSoma*[®] technique is an art form, very much like learning to play the violin.

***NeuroSoma*[®] focuses on more than just muscles.** Properly working in the flower-spray feedback nervous system of skeletal muscle can affect things you might never imagine could be connected to muscle. Did you know that many of your organs and deep muscles are insensate? Only a few internal organs have nociceptors (pain receptors) that transmit somatic pain. Internal organs do have pain receptors sensitive to stretching, oxygen deprivation, or inflammation, but visceral pain is often referred to and consequently perceived in distant parts of the body, often on or near the body surface. The brain, lungs, liver and kidneys are "sensitive" to pain, but pain in these regions tends to be referred to nearby areas, such as neck pain in meningitis, chest pain in pneumonia, abdominal tenderness with liver pathology, and flank pain with kidney stones. In fact, a muscle therapist with knowledge of reflex nerve points can often relieve indigestion, sinus congestion, and allergies, among many other conditions. For more information on this technique, go to www.neurosoma.com.

Things you can do yourself (*suggestions from the perspective of muscle health*):

- **Take a 20-minute walk after any form of exercise.** This will not only cool you down, but will increase circulation to aid in removal of lactic acid.
- **Walk 20 to 45 minutes once or twice daily.** Use a relaxed stride while stretching out the back leg for a second prior to lifting that leg and placing it in front; this radically increases circulation and may help alleviate existing muscle spasm.
- **Ice an injured muscle only on the day of injury,** and then only if the injured area has swollen to the point where the skin is shiny. Icing actually throws the muscles into thermal shock and decreases circulation in deep arteries and veins, because it draws the blood to the surface in an attempt to warm the tissue. Swelling, within reason, is a natural part of the healing process.
- **Avoid hot baths and saunas.** These also throw muscles into thermal shock and reduce circulation in the deeper veins and arteries, because the blood rushes to the surface in an attempt to cool those tissues. Heat feels so good because it causes endorphin release.
- **Drink plenty of water** to keep muscles hydrated and resilient.
- **Don't sit at a desk,** on a sofa, even in a chair or car for hours at a time. Take breaks every hour or two where you walk for 10 minutes then resume your task or trip. It is all about circulation.
- **Seek out any exercise that allows your muscles to relax between contractions,** to let venous blood drain from the muscles. For example, if you lift weights, do one or two repetitions with a heavy weight, then rest for 2 or 3 seconds before your next repetition. In swimming, stroke and glide, or biking, pedal and glide. Instead of jogging, sprint for a lap and then walk for a lap. Exercise initially to get your heart rate up; it will stay up when alternating between effort and relaxation.

- **And finally, avoid static stretching**, either post-exercise or in any stretch & hold technique. When you go into a stretch, find the end of it and keep on moving! Return immediately to either a neutral position or move into another position. Let nature be your guide. Observe the movement of kids and cats – they naturally stretch in continuous motion.

We humans have 11 ‘systems’ within our bodies: cardiovascular, digestive, endocrine, integumentary, lymphatic, muscular, nervous, reproductive, respiratory, skeletal, and urinary. Each system contributes to the homeostasis of other systems and of the entire organism; no system works in isolation because each is intrinsically related to all the others. Skeletal muscle represents about 50% of your body’s mass; it’s a significant system. Thomas Griner, the NASA engineer who put the pieces of this puzzle together, pioneered the recognition of the function and malfunction of skeletal muscle. His book, “What’s Really Wrong With You? A Revolutionary Look at How Muscles Affect Your Health” (available at www.biopulser.com), helps readers understand how caring for their muscles promotes healthy homeostasis and a long life in a youthful and pain-free body.

Tamsin Stewart has studied and practiced NeuroSoma® Muscle Therapy for over 30 years. Her clients have included actors, singers, dancers, and dignitaries, among others. She wrote and developed a 120-hour course and has taught the NeuroSoma® technique since 2001. She has graduates in England, New Zealand, South Africa, and the United States. Her students have included massage therapists, chiropractors, medical professionals, and lay people interested in helping friends and family. To learn more about muscle therapy, NeuroSoma® Seminars, or to schedule a free, 30-minute telephone consultation, please contact Tamsin at info@neurosoma.com, or 434-985-1213.