

Repetitive Strain Injuries:

Muscle and Tendon Disorders

By Tamara Mitchell



In this article we will discuss Repetitive Strain Injuries (RSI) that affect muscles and tendons. Most people experiencing RSI have muscular conditions rather than nerve disorders.¹ These people report more overall pain than those with nerve problems. They also report more emotional consequences of RSI since so many aspects of life become painful.¹

We would like to remind you that self-diagnosis is risky. It's often difficult for trained professionals to diagnose RSI, so if you are having problems, please seek the help of a health care provider familiar with the diagnosis and treatment of RSI. Attempting to diagnose and treat yourself may lead to further injury if you do not correctly identify the problem.

To maintain health of muscles and tendons, it is important to take frequent breaks from repetitive activities or activities that involve static or dynamic tightening of muscles. Get up, move around, get the blood and lymph circulating throughout your body. Doing stretches helps relax the muscles that have been used intensively, relaxes the ligaments that have been under tension, increases blood flow, and moves lymph which can pool without the assistance of movement and stretching. The lymph system is somewhat overlooked, but it is a system of vessels similar to blood vessels that carry lymph fluid. Lymph normally bathes all cells, removes toxins, metabolic waste, and transports white blood cells to fight disease from the body.² The system has no heart like the circulatory system does, so the only way to keep the lymph system healthy is through muscle movement, stretching, and lymphatic massage.² Muscles move the lymph and prevent inflammation and swelling, while the lymph carries away toxins and keeps the muscle and tendon tissues healthy.² Please refer to our web page on Stretches to find some good examples and YouTube videos on relaxing various parts of the body: <http://working-well.org/Website/stretches.html>.

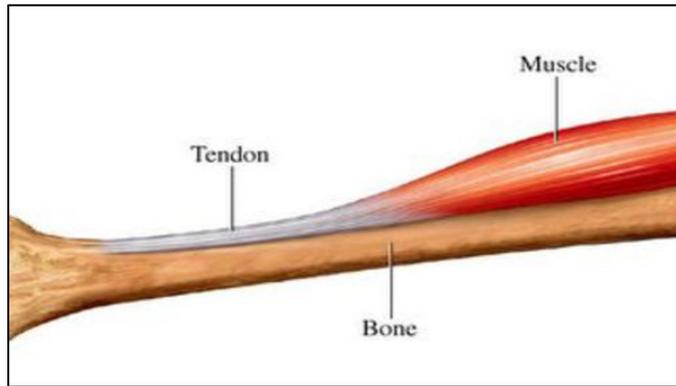
Exercising opposing groups of muscles and tendons keeps the joints balanced. If you use your biceps a lot which bend the arm, make sure to strengthen the triceps which are used to straighten the arm. If you do a lot of typing or other gripping or grasping activities using tools, work on strengthening the extensor muscles and tendons in the hand to balance hand strength and prevent one muscle group from dominating that joint.

Tendinitis, tendinosis

Tendons are fibrous extensions of the muscles that attach directly into the bone.¹ Ligaments, on the other hand, are also fibrous connective bands, but they connect bone to bone to stabilize joints and are less flexible than tendons.³ So tendons are involved in joint movement while ligaments are involved in joint stability.³ Although tendons have some flexibility, they don't have a lot, so microscopic tears can occur with overuse, which lead to the inflammation and pain common with tendinitis (inflamed tendons).^{1,4} A torn or overstretched tendon is called a strain (as in Repetitive Strain Injury).³

Similar to tendinitis, tendinosis is also caused by chronic overuse of a tendon and microtears, but there is no inflammation, the condition is chronic, and the actual tendon tissue degrades.⁵

Tendonitis is often a result of performing everyday activities such as sports, hobbies, using a computer or other occupations with repetitive movements, writing, or working on home improvement or gardening projects. It is usually considered to be relatively short-term and with proper care, it should resolve in a few weeks.⁵



Tendinosis develops when people ignore tendinitis, keep working or playing through pain, have chronic poor posture or other repetitive or activities that chronically strain the tendons.⁵



Be aware that products advertised as “ergonomic” are often exactly the opposite such as the Logitech MX Ergo (shown at left) which has been around for many years and redesigns. Using a trackball that requires repetitive extension and flexion of the thumb including this product, is notorious for causing tendonitis, tendinosis, tenosynovitis and ganglion cysts of the thumb tendons. Sadly, Logitech discontinued an excellent trackball design called the Logitech Cordless Optical TrackMan (shown at right). It uses the all of the fingers to operate the



trackball. This product now sells for hundreds of dollars online! Choose products that use larger muscles, reduce strain, and keep the body in neutral positions without awkward postures, vibration, force, and repetitive movement. If you start to feel pain, stop! It doesn't matter if you paid a lot of money for an “ergonomic” product. If it doesn't work for you, it is NOT ergonomic and the road to recovery, possibly including surgery, is not worth persevering until you are injured. In some cases, it is not the product design at fault, but the posture you are using. Working with a bent wrist, slouched posture, head forward posture or reaching overhead or too low, all strain the body regardless of good product design.

Inflamed or damaged tendons are painful to the touch; the pain can feel dull, achy, and sometimes nauseating.⁴ In the case of tendinosis, stiffness and restricted movement or the appearance of a tender lump may occur.⁵ There can be swelling, throbbing, or weakness. Tendinitis or tendinosis can occur anywhere tendons attach muscle to bone throughout the body. As we age, tendons weaken and become more prone to injury.³ Tendinitis and tendinosis will not cause the numbness or tingling that nerve damage does, but it may cause weakness, a tendency to drop things, reduced grip strength, or pain in an area that is not specifically muscle in an area of the body.

Extensor tendinitis affects the muscles used to straighten (or extend) a joint. When this is in the hand, pain appears on the top of the hand near the wrist or in the thumb. Typing can have many strained positions, such as holding the pinkie in the air, reaching for the shift key, or holding the hands for a prolonged time with the wrists bent which places excessive, repeated strain on the tendons.¹ In sports such as tennis, the elbow often experiences tendinitis from strokes such as the backhand that require repeated straightening of the elbow and force when hitting the ball.⁶

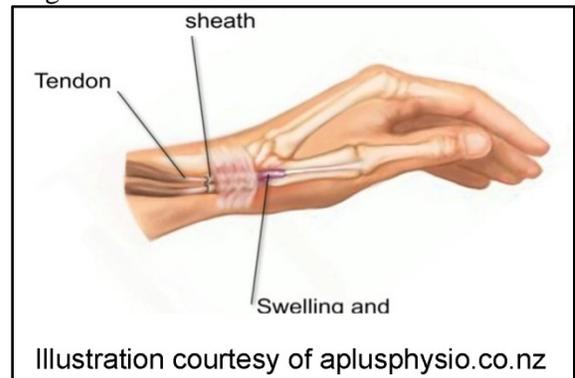
Flexor tendinitis affects the muscles used to bend (or flex) a joint. This can develop in any tendon that is overused in joint flexion such as gripping with the hands,

Treating tendon tendonitis. The usual treatment for tendon injury is rest, ice, compression, elevation, and medication (such as anti-inflammatories). In the case of repetitive strain injury to the tendons, it is important to identify the underlying cause of the strain. This may be due to improper posture, form, overuse, and/or bad habits.

Tenosynovitis

A protective sheath known as the synovium covers tendons and it is filled with a lubricating fluid called synovial fluid.⁷ The synovial fluid keeps the tendon sliding smoothly through the sheath unless something damages the tendon or the sheath becomes inflamed.⁷ Injury to the tendon can result in the sheath failing to generate synovial fluid resulting in inflammation of the sheath as the tendon sticks in the sheath and it becomes irritated.⁷ In repetitive strain injuries, the synovium can thicken and the fluid may become more viscous or it can be overproduced causing more friction for the tendons because of compression due to too much fluid.^{1,4} Tendons don't glide through the sheath as smoothly and become swollen and thickened, leading to pain and inflammation.⁴ If the tendon sheath swells nerve compression can result, which is the case in carpal tunnel syndrome.

Generally tenosynovitis is a result of repetitive strain to the tendon, though it can result from other health conditions such as rheumatoid arthritis, scleroderma, gout, diabetes, and others.⁷ The symptoms are commonly joint stiffness, swelling, pain, or skin redness.⁷



Treating tenosynovitis. Alternating heat and cold may help reduce inflammation and pain. Resting the affected area is important to allow it to heal. Massage, stretching, transcutaneous electrical nerve stimulation (TENS), and ultrasound may be recommended by your health practitioner.⁷ Anti-inflammatory medications will likely help, too. Long-term, as with any repetitive strain injury, it is important to identify the cause of the strain and correct it. Find postures and ways to perform your tasks without causing injury to the tendon and tendon sheath. If there is an underlying health issue, treatments may be available to help with that also.

Ganglion Cysts

Ganglion cysts are raised bumps, about a half inch in diameter, usually occurring on the wrist, finger joints, or nailbed.^{1,8} They are due to herniation of the synovial fluid, occurring on the tendon, tendon sheath, or synovial lining. The only time they are dangerous is when they compress a nerve,^{1,8} though they can appear alarming. Cysts are a sign of wear and tear, so attention should be paid to the stresses placed on the associated tendons. Since they generally pose no problem, they may be left untreated.^{1,8} In the case of nerve compression, they can be treated surgically.



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Muscle strengthening and balancing

Muscles and tendons work together to bend and straighten the many joints in the body. Flexor muscles contract to bend a joint while the opposing extensor muscles relax. Extensor muscles contract to straighten a joint while the opposing flexor muscles relax.⁹

Many movements of the body or common postures use one type of muscle more than the opposing muscle, so they can become unbalanced. The hand is often used for gripping, typing, and carrying things, which uses the flexors. In office work and many other activities we tend to have a forward posture, so the front of the neck and chest muscles are in a contracted state while the upper back, shoulders, and back of the neck are stretched and extended. It is important to work to strengthen opposing muscle groups to maintain the balance between flexors and extensors in the body.¹⁰ The squeeze ball shown at right is often sold as a way to strengthen the hand muscles, but in fact, it uses the gripping action already overused in everyday activities. The hand flexor muscles and tendons need to be balanced with strengthening of the extensor muscles and tendons and they need to be relaxed and stretched. If you are having problems with your grip or you are dropping things, it is not an indication that you are weak! It is an indication that you are likely experiencing repetitive strain of the flexor muscles and tendons.



The Cat's Paw is a product designed to strengthen the extensor muscles and tendons of the hand. The same thing can be accomplished by doing one of the following exercises:¹¹

- Fill a bucket with rice, small pasta, coarse gravel, sand, or cedar chips. The finer the material, the harder the exercise will be, so start with something like rice rather than sand. Plunge your hand into the bucket with your hand closed and then open your fingers outward against the rice and repeat several times until you start feeling a bit of fatigue. Do the other hand, too.
- Wrap thick rubber bands around your fingers and then open your fingers out against the pressure of the bands. This video demonstrates how to do this. Rubber bands used on produce such as bunches of broccoli work well. <https://youtu.be/4tzfyEyNnGM>
- Find a jar that your hands can slip into and that has a neck smaller than the body of the jar so it won't slide off your hand when your hand is hanging downward. Put something in the jar. This can be water, sand, pebbles, small fishing weights, etc. to increase the weight of the jar. Put your hand in the jar and extend the fingers outward against the jar, then walk (farmer's walk) with the jars on your hands. Don't use too much weight at first, then increase the weight as your hands get stronger. The jar shown is a ½ gallon canning jar.



Muscle inflammation (Myositis)

Muscles can become inflamed for many reasons, but one reason is strain from overuse or poor posture.¹² Muscle problems usually result in aching or searing pain, loss of grip strength or stamina, or pain when you move. Most people have experienced muscle pain following a strenuous workout. Overuse of muscles is not restricted to sports injuries. When you feel that burning sensation in your neck, shoulders, or back, it is a symptom that your posture is incorrect and your muscles are working too hard in a static position to hold the weight of your head, your arms are extended too far forward, your back is not supported, or you are not giving your body enough breaks and recovery time to relax and recover. With muscle trauma, your nerves are usually in fine condition; they are simply reporting the pain.¹

The muscles and tendons work together. Tight forearm muscles strain tendons of the fingers because they have to work harder. The shortened muscles and tight, inflexible tendons cause increased friction and cause further inflammation and tendinitis. Inflammation can cause swelling which may press on a nerve, leading to neurological problems.⁸

To avoid overuse and inflammation of muscles, make sure your tools or workplace are set up so that you can work in a neutral and relaxed posture. Avoid cold environments which make muscles inflexible and more prone to injury. Stretch periodically to ensure blood flow through the muscles. Take frequent breaks to stand up and move around. Again, relaxing the muscles, improving circulation, and giving them a few minutes to relax is important.¹²

Generally muscle inflammation is temporary. It can be relieved through rest, ice, and compression, but the source needs to be addressed or it will recur.¹² Avoid the use of anti-inflammatory medications.

Myofascitis/myofascial pain syndrome

When muscles are inflamed, it is not uncommon to also have inflammation of the fascia surrounding the muscle. The fascia is a tough connective tissue that encases muscles and other structures of the body. Myofascitis results in sensitive spots in the muscle known as trigger points.^{13,14} It may feel like a deep, aching muscle pain or a tender knot in a muscle. When pressure is applied to a trigger point, pain may be felt in a different part of the body.¹³ Trigger points occur at predictable points in the body and diagnosis involves pressing a trigger point resulting in the practitioner feeling a twitch or jump in the muscle.¹⁵

Myofascial pain syndrome generally occurs as a result of repeated contraction of a muscle from doing work, hobbies, or sports, from muscle injury, or it may be due to stress-related muscle tension.^{14,13} Other causes may be nutritional deficiencies, a very sedentary lifestyle, awkward postures, or hormonal changes.¹³ The difference between ordinary muscle tension and myofascial pain syndrome is that the pain continues or worsens over time.¹⁴ Myofascial pain syndrome may make it difficult to sleep at night due to muscle aching or difficulty finding positions that don't aggravate a trigger point.¹⁴

There are various treatment options and no single one will likely result in relief. Try multiple approaches including physical therapy, trigger point massage, dry needling, or injections, ultrasound therapy, pain medications, or in stress-related cases, relaxation techniques.^{13,14} Myofascial release, a deep tissue massage technique, is used in the case of tendinitis, myositis, and/or myofascitis. By stroking along the line of muscle fibers, the therapist reduces adhesions and "stickiness" of the inflamed tendons and muscles, increases fluidity of muscle movement and increases circulation. This procedure may be painful and is followed by ice therapy to reduce swelling and inflammation.⁴ Trigger point massage increases blood flow, warms up the muscles, and helps ease pain generally through applying pressure directly on the trigger point and then releasing it, releasing the tension at the same time.¹³ This can be quite painful, but is effective. Dry needling involves poking a needle into the trigger point and it is one of the most effective ways to relax the muscle and fascia, however it is quite painful.¹³ Injections are often less painful and involve the use of saline or a local anesthetic like lidocaine.¹³ Ultrasound treatment can heat up and relax muscles, improve blood flow, and remove scar tissue, though its effect on relieving pain may be minimal.¹³

Self-treatment can involve the use of moist heat, a vibratory massager, a trigger point massage tool, and increased exercise, stretching, yoga, or pilates. Improved posture, a better chair, bed, office ergonomics, sports coaching, and improved hobby ergonomics can help a lot as well as awareness and reduction of awkward postures, bad habits, and repetitive motions.

There is some research that indicates that if left untreated, myofascial pain syndrome may develop into fibromyalgia, so seeking treatment is important.¹⁴

Muscle damage

When muscles are overused, the body can't keep up with the destruction of tissues and may replace them with scar tissue, which is inelastic.⁸ Overuse of muscles causes cells to break down, releasing waste products that produce pain and inflammation. The body normally carries away these waste products, however use of anti-inflammatory drugs (such as aspirin) causes a disruption of this process. Instead of being cleansed away in the bloodstream, the waste products settle into scar tissue that then bind muscles and tendons and make them work harder.⁸

Muscle knots can form anywhere in the body, but they usually occur in the neck, shoulders, back, or gluteal muscles.¹⁵ Muscle knots are hard, sensitive areas of muscles that are tightened and contracted even when the muscle is not working. Overuse, poor posture, and being sedentary are the most common causes of muscle knots. Dehydration, unhealthy eating habits, stress, and anxiety are also associated with muscle knots.¹⁵ Muscle knots are generally associated with myofascial pain syndrome, which affects that fascia or membranes surrounding the muscles. Treatment for knotted muscles is the same as for myofascial pain syndrome.

Micro-tears in the muscle is another form of damage that can occur when use of a muscle and associated tendons are used and do not have time to heal before repeated use. Often this is due to the fact that the muscle is required for a person's work, sport, or hobby. There are times when there is not enough time to rest and heal, or it is a hobby or sport that is a passion and people push through discomfort and pain.¹⁶ The preferred approach would be to rest the muscle completely between intensive usage. Over time, microtears continue until the muscle and tendons are inflamed. The body heals the microtears by building up scar tissue. After a while, inflammation subsides and the condition becomes chronic. The pain is chronic in the area of the injury and the scar tissue can form lumps.¹⁶

As with muscle knots and myofascial pain syndrome, the way to start healing the scar tissue and break up the muscle adhesions is through deep and continued stimulation of the tissues. This improves circulation and helps break apart muscle fibers and scar tissue that has grown together at the injury site. This should be performed ONLY after inflammation has subsided, not during the acute phase.¹⁶ In many locations on the body it is possible to do self-massage as shown in this video: <https://youtu.be/N5RX2yh3JKk>
The tool and gel used in this video are shown below.

	
Massage Star	Sombra pain relieving gel with Camphor and Menthol

Reducing inflammation through diet.

In addition to therapy, it is important to recognize the importance of taking care of yourself. Since hormones called prostaglandins control inflammation, and prostaglandins are produced from fatty acids, you can, over a period of weeks, affect the inflammatory response by modifying the type of fats you eat. Increase the quantity of Omega-3 fatty acids in your diet by eating lots of wild salmon, sardines, walnuts, freshly ground flax seed or oil, and soy foods, or consider taking one of the new pharmaceutical grade fish oils.^{17,18} Incorporate lots of fresh, organic fruits and vegetables in your meals.^{17,18} Reduce your intake

of polyunsaturated fats and oils, and oils high in Omega-6 fatty acids (sunflower, corn, soy, and safflower) and replace them with oils that are high in Omega-3 fatty acids.¹⁷ Which oils you choose depends to some extent on the method of food preparation you are using. Oils with a low smoke point should not be used for cooking, but are great for salads such as flax seed oil which is high in Omega-3 fatty acids and has a lovely nutty flavor.¹⁹ Walnut oil, mustard oil, avocado oil, and canola oil are better for cooking and contribute some Omega-3 fatty acids.¹⁹ Olive oil can withstand some heat and has many health benefits, but is not outstanding in contributing Omega-3 fatty acids.¹⁹ Refer to Reference 19 for a complete table on the balance of fatty acids and smoke point of most oils.

ONLINE RESOURCES:

Please refer to our website for a large library of stretches and links to stretch videos categorized by body part: <http://working-well.org/Website/stretches.html>

Self-massage, stretching, and myofascial release

Office stretches (11 ½ min): <https://youtu.be/KVpR0luQYUs>

Stretching and massage for forearms and hands: <https://youtu.be/v4caysd7Oy0>

Knots in neck, shoulders, upper back: <https://youtu.be/9PC9Mn0VO00>

Stretches for tension headaches: <https://youtu.be/geZmAsTSx5g>

Lower back: <https://youtu.be/U390c5-9fX8>

Exercises for sciatica: <https://youtu.be/bgY7uWPOIRA> and <https://youtu.be/fDkw-Zi5MBg> (exercises start at about 9 min into video).

Myofascial release for the forearm flexors and extensors: <https://youtu.be/xf72fBX0zvk>

Office strengthening exercises and correcting posture:

Lower back: <https://youtu.be/QumlJTVhVCc>

Whole body: <https://youtu.be/9aWvWlow3Rw>

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This article and all of our articles are intended for your information and education. We are not experts in the diagnosis and treatment of specific medical or mental problems. When dealing with a severe problem, please consult your healthcare or mental health professional and research the alternatives available for your particular diagnosis prior to embarking on a treatment plan. You are ultimately responsible for your health and treatment!

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