My Aching Back!

Low Back Pain
Causes, Prevention, and Treatment

By Tamara Mitchell

Almost everyone experiences low back pain at some time. 80% of adults will experience low back pain at some point in their lives.\(^1\)\(^2\) About \(\frac{1}{4}\) of adults reported low back pain during the past 3 months in a large survey.\(^1\)

As with many types of physical pain, low back pain falls into two categories: acute back pain and chronic low back pain. Acute low back pain is often caused by muscle strains, ligament strains, and other temporary painful events and it often resolves within days or weeks. Chronic low back pain is pain which generally arises from more permanent damage and lasts for over three months.

Ironically, the severity of the pain is often unrelated to the severity of the damage. The nerves in the low back supply signals of pain for the discs, muscles, ligaments, and other parts of the spine, so a pulled muscle may feel exactly like a torn lumbar disc.\(^2\) The causes of pain can be very complex because there are so many structures in the low back and there is a lot of variation in pain sensations.\(^2\) To add to the challenge, when you are suffering back pain, it's hard to decide what type of treatment to seek. Doctors rarely agree on how to treat back pain since they often don't understand what causes it, or if it's not something they are specialized to correct, they offer no suggestions or referrals to other types of practitioners who may help.\(^3\) Who you see determines what type of treatment you get. From rheumatologist to neurosurgeon, from chiropractor to massage therapist, each has a different view of what causes low back pain and will treat you accordingly. If a surgeon doesn't find a problem he can fix, he will probably not refer you to a physical therapist or an ergonomist.\(^3\) About $50 billion dollars were spent last year by patients seeking help with back treatment and the incidence of low back pain is rising steadily in the U.S.\(^4\)

Should you see a physician?

Most low back pain can be treated without advice from a doctor. However, there are a few symptoms that are potential indications of a serious medical condition. You should seek medical attention immediately if you experience:\(^5\)
- Sudden bowel and/or bladder incontinence
- Progressive weakness or pain in the legs, feet or toes

Low back pain in children should be treated seriously. The types of injury that occur to the low back are somewhat different in children. Backpacks, competitive sports, skateboarding, biking, and gymnastics all put a lot of strain on developing low spine and often result in falls or impact involving the tailbone, low spine and feet.\(^1\)\(^6\) When a child or teen complains of back pain, a medical diagnosis is needed to determine the cause and appropriate treatment.\(^6\) Tumor or infection of the spine are not common, but are serious and should be addressed immediately.\(^6\) In the case of injury, non-surgical treatments are generally successful.\(^6\)
The Lower Back
The lower back, called the lumbar region, is a complex structure of vertebrae, discs, spinal cord, nerves, ligaments and muscles. The lumbar region of the back supports the weight of the upper body. The lower spine naturally curves slightly inward toward the abdomen. The lumbar region consists of:

- **Five vertebrae**, called the lumbar vertebrae (labeled L1-L5).
- **Six discs**, made of spongy pads of cartilage, that cushion and stabilize the lumbar vertebrae. 80% of the disc is water. The disc with the attached part of the vertebra above and below is considered an intervertebral joint, allowing movement of the back.
- **Facet joints** that connect the two lower projections of one vertebra to the two upper projections of the vertebrae below it.
- **Muscles, tendons, and ligaments** that attach to the vertebrae and are responsible for supporting the upper body and for movement of the spine.
- **Spinal cord and nerves** that travel through a central hole in each vertebra and the nerves come out to the sides off the spinal cord and spinal column at each vertebra.

A more detailed depiction of the spine and associated nerve control centers is shown at the very end of this article, Attachment 1.

Low Back Problems
Men and women are affected equally by low back pain. Problems occur most often between ages 30 and 50. Back pain can have a wide variety of characteristics:

- Onset of pain may be sudden, gradual, or gradually increasing over time.
- The pain may be constant, intermittent, or only occur with certain positions or activities.
- The pain may remain in one spot or radiate to other areas.
- It may be a dull ache, or a sharp or piercing or burning sensation.
- The problem may be in the neck or low back but may radiate into the leg or foot (sciatica), arm or hand.

Low back pain may be acute, lasting a few days or weeks, subacute, lasting between 6 weeks to 3 months, or chronic, lasting more than three months. In most cases sudden acute back pain is caused
by injury to the muscles and/or ligaments and may result from muscle spasms or a tear in the muscles and ligaments. In fact, research has found that people tend to compensate for back injuries by guarding the injured area, using more muscles and inappropriate muscles to avoid feeling pain. This can lead to inappropriate loading of the spine and eventually to more serious back injuries such as disc degeneration. Since the lumbar vertebrae are at the bottom of the spinal column, each one bears progressively more weight from the torso and are more prone to degradation and injury.

50% of people recover from back pain in less than two weeks. 90% of people recover from back pain in less than three months. That means that only 10% of people with back pain continue on to have chronic back pain. Many people say they “threw their back out”, but in reality, muscle, tendon, or ligament strain is generally the problem. The fear is always that something is structurally wrong, but in most cases this is not accurate.

As people age, there is a decrease in bone strength, decrease in muscle elasticity and tone, and the discs dry out. Pain may also be caused by degenerative conditions such as arthritis or disc congenital abnormalities in the spine. Obesity, smoking, weight gain, stress, poor physical condition, inappropriate posture, and poor sleeping position may also contribute to low back pain. Pregnancy often results in low back pain due to changes in the weight loading on the body. Genetics play a role in some low back problems. Anxiety and depression can increase back pain through mechanisms such as muscle tension, while conversely, low back pain can also be a source of anxiety and depression.

In a few people, skeletal irregularities produce strain on the vertebrae and supporting muscles, tendons, ligaments, and tissues. These irregularities include scoliosis (a curvature of the spine to the side), lordosis (an abnormally accentuated arch in the low back), back extension (a bending backward of the spine) and flexion (a bending forward of the spine).

Fibromyalgia is believed to be a result of inflammation of the body's connective tissue and it may cause chronic back pain. For more information on Fibromyalgia, please read our article: [http://working-well.org/articles/pdf/Fibromyalgia.pdf](http://working-well.org/articles/pdf/Fibromyalgia.pdf).

**Muscles, tendons, and ligaments of the low back and how they get injured.**

Muscles, ligaments, and tendons support the spine. Ligaments connect bone to bone. Tendons connect muscle to bone. In this case, they connect the vertebrae to each other. The muscles of the back connect each vertebral segment to the next, are responsible for holding the body upright, and support the weight of the upper body. The abdominal muscles, located at the front and side of the abdomen, are very important in supporting and protecting the abdominal internal organs and also play an important role in posture and spinal alignment.
Most low back pain is caused by damage to the muscles, tendons, or ligaments in the lower spine. These injuries can be extremely painful. A strain is a muscle tear caused by overuse or overstretching. A sprain is a tear or overstretching of a ligament that connects bones together. The symptoms and treatment for both of these injuries is identical. When any of the soft tissues of the lower back are injured, they usually become inflamed and this may cause muscles to spasm or cramp. This is effectively a “Charlie Horse” in your back and is intensely painful, though not normally a serious injury.

Injury to the lower back soft tissues can be caused by one single event such as heavy lifting, twisting, sudden impact such as a car accident, or it can be due to overuse such as in sports or work activities that require repeated motions, poor posture and weak abdominal or back muscles, or starting a new sport or activity that puts stress on a muscles that are not conditioned for the work.

Discs
Discs are really interesting structures in the spine. They are structures that perform several functions. They act as shock absorbers between each vertebra, they act as ligaments by holding the vertebrae

Illustration courtesy of DeanSomerset.com
Illustration courtesy of Ref. 13
together, and they are cartilage-type joints that allow for mobility in the spine. There is a tough outer layer called the annulus that is composed of concentric layers of collagen fibers. And there is an inner core that has a gel substance with loose fibers suspended in the gel.

The gel in the discs begin to dry out and lose flexibility as we age, decreasing their ability to cushion the vertebrae. When we are young, the discs contain about 85% water, but in older people, this decreases to 65%. Discs have no blood supply, so there is no way for them to repair themselves. If the damaged disc is causing pain, the pain can continue for years since there is no way for the body to repair them.

Disc tears. Discs can tear on the annulus, often with aging and drying out of the gel over time. Depending upon where the tear is located, there can be no pain at all or there can be pain that lasts weeks, months, or longer. It is not well understood why some people experience pain and others do not, but it may be due to the location relative to nerves.

Bulging discs. A bulging disc also happens with age as the gel dries out causing the disc to flatten and sometimes part of the annulus bulges out between the adjacent vertebrae like sidewalls of a flat tire. A bulging disc is different from a herniated disc and does not benefit from more aggressive treatments.

Slipped discs (spondylolisthesis). As with disc tears and bulging discs, slipped discs are considered degenerative disc disease because they happen with age. As the disc ages, it loses its ability to function as a ligament, holding the vertebral bones in alignment. The discs start to shift back and forth a bit. Sometimes this shifting involves hitting a nerve and this can cause pain. In the lower back, this can involve the nerves to the legs and result in sciatic nerve pain.

Collapsed discs. As with the other degenerative problems above, discs can lose nearly all of their gel and become flattened or collapsed. This is called spondylosis or spinal arthritis. When this happens, the vertebrae above and below are no longer cushioned, so the bones rub together, the facet joints wear, and sometimes bone spurs develop. Any of these things can result in pinching nerves which cause pain or sciatica. Spondylosis can also cause stiffness after periods of inactivity or numbness/tingling sensations (paresthesia). In almost all cases, treatment does not include surgery. Physical therapy, massage, ultrasound, stretching and warm-up exercises, strengthening exercises to improve flexibility and support for the spine, weight loss, and instruction on correct movement to reduce pain, including good posture are all things that can reduce discomfort.

Herniated discs. A herniated disc is when the gel in the nucleus pushes against the annulus and the disc bulges out. When the disc is very
worn or injured, the nucleus may squeeze all the way through the annulus. There are various degrees of disc herniation. When the herniation is located in a spot that presses against certain nerves as they exit the spinal column, it produces sciatica resulting in pain radiating into the buttock or down the leg, sometimes accompanied by a sensation of numbness or tingling in the leg. Herniated discs are one case where there may benefit with more aggressive treatments or surgery.

Vertebrae and facet joints
Each vertebra has four facet joints, one joint on the left and one on the right side of the vertebra as well as on the top and the bottom. They are located at the back of the spine and if you look at the first picture in this article, the lateral view, the facet joint bones look like legs on a centipede. The facet joints keep the spine from twisting too far, extending back too much, keep the vertebrae from slipping forward, and generally give the spine stability. As mentioned in the above discussion of discs, the primary problem with facet joints in the lumbar area is caused by osteoarthritis (spondylosis), flattening of the discs, and general wear and tear on the joints. The facet joints are the part of the spine that supports the vertebrae and are moving parts, thus they are the part that tends to wear out, develop bone spurs, and cause lower back problems, generally with increasing age. Exercise to reduce stiffness and improve strength is protective of the vertebrae and facet joints.

Spinal cord and nerves
The spinal cord and nerves that travel through a central hole in each vertebra. The nerves that come off the spinal cord are called nerve roots. They pass through small openings on either side of the connecting vertebrae and combine to form spinal nerves. There are five pairs of lumbar spinal nerves. The bundle of nerve roots that exit the bottom of the spine is called the “cauda equine” because it looks like a horse’s tail. A detailed nerve chart of the whole back is shown in Attachment 1.

Lower Back Injury Prevention
Wear and tear on the spine happens with age, so some injury is almost unavoidable. Whether you are very active and use your back a lot or whether you are relatively inactive and your core muscles have weakened and no longer support the spine well, it is almost inevitable that the spine will develop some issues over the years. There are many, many things that can be done to minimize the risk of developing low back problems. If you are tired of hearing that exercise, diet, not smoking, and maintaining a healthy weight are the golden answers, you’ll hear it again in the context of low back pain!

What doesn’t work
Despite advertising to the contrary, back belts and shoe insoles or orthotics do not prevent nor relieve low back pain. Ultrasound and traction are also ineffective. While people are spending money and time on these treatments, or taking pills to numb the pain, they are distracted from doing things that have been shown to be effective and they may feel that they are doing everything they can to manage their problems.
Prescription opioids do not improve functioning of patients with chronic low back pain.20

**Exercise**

Exercise, muscle tone, and flexibility are all very effective in preventing low back pain and reducing recurrence of episodes.21 As noted by researcher Chris Maher, “What we do understand about the back is that the more you use it, the more likely you are to keep it strong, fit, and healthy.”19

Building and maintaining the muscle tone and flexibility in your back, abdominal and side muscles (obliques and rotators) otherwise known as the core muscles is essential for maintaining the neutral spine position. Many muscles of the body are used to move in walking, climbing stairs, etc., but the deep back muscles and abdominal muscles are not used much in everyday activities, so they tend to weaken with age unless they are specifically exercised.22 Weak abdominal muscles cause the hip flexor muscles to tighten, causing an increase in the curve of the low back and this unhealthy posture, called lordosis, can cause low back pain.22

People who are active and well-conditioned are much less likely to suffer from low back pain due to muscle strain. Strong and flexible muscles are less likely to strain, tear or spasm.1,17 Keeping leg and gluteal muscles strong will also help you use correct body mechanics throughout everyday activities.22 Interestingly, tight hamstrings increase the stress on the low back by limiting the motion in the pelvis and transferring it to the lumbar spine segments.22 If your hamstrings are tight, work to stretch, lengthen and relax them to avoid back pain.

Core strengthening exercises are important, but so is overall exercise and fitness activities.23

Movement and exercise help the back by:23,24

- Allowing discs to exchange fluid and nutrients similar to wringing out a sponge and allowing it to swell with water.
- Reducing swelling and inflammation that deprives discs of nutrients.
- Keeping ligaments and tendons flexible and improving mobility.
- Stretching, strengthening, and repairing muscles that support the back.
- Lubricating the facet joints.
- Improving circulation which provides nutrients to the whole body including muscles, bones, and discs.
- Releasing endorphins which provide natural pain relief and elevate the mood.
- Minimizing the frequency and severity of back pain episodes.

So, what activities are most effective in preventing low back pain and helping to reduce recurrence? The answer is not straightforward. Too much or too little physical activity are associated with low back pain.25 There is no consensus on what exercise is best for low back health, but the recommendation is the same as for the general public.26

- Low impact aerobic conditioning is also important in supporting healing, promoting blood flow, and improving overall health.12 Low impact aerobics, walking, hiking, bicycling, and swimming are all excellent fitness activities and they should be done for 30-40 minutes three times a week.12,26 Choose one or more that is convenient and that you enjoy. Make sure you use proper form and good posture!27 Some people like walking with friends or joining a class.26 Do whatever motivates you and keeps you interested and excited about your work-out. Sports are great, but they do not substitute for a regular exercise program.
• Core strengthening exercises and resistance training should be performed on the alternating days at least 2-3 days a week. Exercise and lift weights at a moderate to vigorous level, but remember that you are improving your strength and muscle endurance, not training for competition. Pilates and exercise ball routines are especially good for strengthening the core. Always remember to breathe! Do not hold your breath. Avoid heavy lifting that will strain your back, but do focus on good form, using your core muscles: abs, back muscles, and gluteal muscles.
• Flexibility and movement of chi are emphasized in yoga and tai chi, which can be done in place of core strengthening a couple of days a week.

**Education**
A review of research on low back pain found that education about back pain, especially when accompanied by an exercise program helps to prevent it and treat it. So, reading this article is already helping you!

**General Health**
Research has shown that the current epidemic of obesity in the U.S. is resulting in abnormal calcification of spinal ligaments in younger people (under the age of 50), specifically the Ligamentum flavum. Excess fat and insulin-resistance has been indicated in the increase of pro-inflammatory agents in the blood and may be the factor responsible for affecting bone metabolism. Clearly, weight loss is of primary importance in maintaining health for many reasons, but now it is indicated in spine health for younger people as well.

• Eat a healthy diet. Avoid saturated fats and fried foods. Eliminate processed foods. Shop the outer aisles of your grocery store where you will find fresh produce, fish, and unprocessed foods. Foods can either help reduce or increase inflammation, so diet definitely plays a role in maintaining a healthy back. Take a look at our article on Nutrition: [http://working-well.org/articles/pdf/NutritionNew.pdf](http://working-well.org/articles/pdf/NutritionNew.pdf).
• Lose weight if you need to. It is easy to find out if you should lose some. Use our Body Mass Index calculator: [http://working-well.org/Website/bmi.html](http://working-well.org/Website/bmi.html). Don’t get depressed, just get started on losing weight if you need to! We have an excellent article for you to read that will help you with this! [http://working-well.org/articles/pdf/Overweight.pdf](http://working-well.org/articles/pdf/Overweight.pdf).
• If you smoke, stop! Need help? Our article might give you the boost you need to finally kick the habit: [http://working-well.org/articles/pdf/Smoking.pdf](http://working-well.org/articles/pdf/Smoking.pdf).
• Drinking in moderation unless you are taking medications, tend to use alcohol to kill the pain, or have a tendency to drink too much. Moderate drinking is considered one standard drink daily: One 12 fl. Oz. regular beer daily
  - One 5 fl. Oz. glass of table wine
  - 1.5 fl. Oz. glass of 80-proof distilled spirits
• Manage stress and depression. Some of the information in our article on SAD may help you: [http://working-well.org/articles/pdf/SAD.pdf](http://working-well.org/articles/pdf/SAD.pdf).
• Avoid wearing high heeled shoes which can compromise the natural curves of your back.
• Always warm up with gentle movements before exercise, lifting, or other strenuous activities.

**Neutral posture and good body mechanics.**
The combination of ergonomics and fitness are cited as two of the most important preventive measures that can be taken to reduce or eliminate most back problems and pain. Posture and good body mechanics are also both extremely important in the prevention of muscle, tendon, and ligament injuries. Proper posture corrects muscle imbalances that can lead to back pain by evenly distributing weight throughout
Learning to bend, lift, walk and sit correctly can significantly reduce your chances of ever experiencing low back pain and dramatically reduce healing time if pain does occur. To improve your posture and body mechanics, consider taking a class in the Alexander Technique which teaches people good posture and how to move in a more comfortable and relaxed way. As we develop aches and pains or deal with fatigue, we tend to gradually sink into lopsided and slouched postures, modes of walking, and sitting. It isn’t hard to unlearn these habits and realign our bodies for better spine and back health! Pay attention to body alignment. Don’t wear high heeled shoes, take the wallet out of your back pocket, use cushioned soles when walking. And last, but not least, don't wear high heeled shoes that throw your body out of alignment. Use cushioned soles when walking to reduce spinal impact.

- **Preventing injury at work.**
  Have a chair that fits you, is adjusted correctly, and has good back support. Sit back in the chair; do not perch on the edge of the seat.
  Use a sit/stand workstation can allow the option to change positions frequently. Sitting for hours is not good for the low back.
  Stand up, stretch, and walk around at least once every hour. Use a break timer on your computer if you have trouble remembering to take breaks. Too much sitting is not good for the back, results in weakened muscles, poor circulation of blood and lymph, and puts pressure on the tailbone and bottom of the spine.
  Men, take the billfold out of your back pocket to maintain level hips.
  Sit and stand upright with weight balanced evenly on both sit-bones or feet. Don’t slouch!
  Make sure work surfaces and monitor are at the correct height.
  Consider alternative seating options for part of the day such as a kneeling chair or fitness ball.

- **Preventing injury while driving**
  Adjusting the car seat, there are other reasons back pain may develop while driving.
  1. The body may be tensed, especially when driving during in busy traffic or in unfamiliar areas.
  2. Sitting for long periods of time put extra stress on your spine.
  3. When driving long distances, vibration of the car shakes your whole body and can lead to fatigue and eventually damage to the spine.

These tips are important guidelines to avoid fatigue and low back strain while driving:
  - Adjust your car seat and the steering wheel height and, if possible, the distance so that you are sitting slightly reclined, your upper arms hang down against your sides, not stretched up or out in front of you.
  - Move the seat so that your legs comfortably reach the pedals and your arms are hanging relaxed.
  - The seat height should be adjusted so that the knees are level with the hips.
  - Make sure your head is upright, not jutting forward and that you can see over the steering wheel.
  - If you have to lift your chin to see over the steering wheel, use a cushion or car seat to raise you higher.
  - If the seat doesn’t offer good lumbar support or if the seat is longer than your thighs, get a backrest or seat that will offer the correct adjustments.
  - When driving for a long period of time, stop and walk around at least every two hours to get the circulation moving in your legs.
  - Make minor adjustments to the car seat and steering wheel during very long road trips to relieve pressure points on the body, but still maintain good posture.
  - Avoid using the car as an office.
- Avoid reaching into the back of the car from the front seat.
- When getting into the car, sit first, then swing your legs into the car. To get out, slide the legs out first and then stand to decrease strain on the low back.
- Don’t lift heavy objects right after a long drive. Take time to walk around, do some gentle twisting and bending to warm up your lower back first.

- **Preventing injury while lifting**

  Guidelines for lifting are as follows:
  - Warm up your body prior to lifting.
  - Bend at the hips and knees; never bend from the waist.
  - Turn or pivot your body using your feet, not by twisting or turning your back. Always turn and face the object you plan to lift or move.
  - Use your power zone, or core muscles.
  - Carry the object close to your body. Keep your elbows and arms near you.
  - Center your body weight over your feet, and then start lifting with a thrust of your legs.
  - One foot goes next to the load and one goes behind it when lifting.
  - Grip the load using your full palm. Fingers alone are too weak.
  - Develop and/or maintain good abdominal strength.
  - Avoid sudden, jerky movements which might "overload" your muscles during an activity.
  - Ask for help or reduce the load if it is too heavy.
  - How high does it have to be lifted? Use appropriate tools to elevate the load.
  - How far does it have to be carried? Use a cart if necessary.
  - Don’t try to impress others by lifting a very heavy load.
  - Treat an injury immediately; don't work through pain.
  - Push, don't pull loads.
  - If you are seated, do not bend over to pick something up off the floor. Squat down and stand up straight from the floor.

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<th><strong>SAFE LIFTING</strong></th>
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<td>Face the load</td>
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<td>Feet apart</td>
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<td>Use your legs, not your back</td>
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<tr>
<td>Lift smoothly. Do not jerk to lift!</td>
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• **Preventing injury while sleeping**
  There are no hard guidelines on mattresses or pillows. Your own body weight and sleeping habits determine what is the correct mattress firmness and what pillow you should use. The spine should be as level as possible when you are on your side. If you are a side sleeper, draw your knees up and try putting a pillow between your knees to help align the spine. If you are a back sleeper, a pillow under your knees and a small rolled towel under your lower back may feel best. Sleeping on your stomach is not desirable because it puts a lot of strain on the back and neck. If you cannot sleep in any other position, try putting a pillow under your stomach to lift your lower back and try sleeping without any pillow under your head. Try to arrange the room so that your bed is not on an exterior wall of the house or building. Interior walls and walls away from windows will avoid drafts and exposure to cold or hot exterior weather contrasts.

**Recovery and treatment**
Home treatment for back pain due to acute strain or chronic severe issues can be effective in a large number of cases. A multidisciplinary approach to dealing with low back pain is generally effective.

Treatment for lower back soft tissue damage generally involves the use of NSAIDs (Ibuprofen, aspirin, or naproxen) and ice packs to reduce inflammation. Heat packs can improve circulation starting about 48 hours after injury and massage therapy is helpful in increasing circulation and relaxing the muscles. Walking and staying active is very important to keep the spine functioning, relieve stiffness, and reduce discomfort and pain. Even short walks are better than remaining stationary. Spinal manipulation (chiropractic/osteopathic) and acupuncture can also be very helpful in relieving pain. These activities may be very painful, but they keep the muscles and other tissues from further spasms and stiffness and they will speed healing.

When the low back strain is a result of lack of muscle conditioning, a program of stretching and strengthening exercises should be undertaken to increase general core strength and flexibility. The program should be designed specifically for the individual based on the current level of fitness, diagnosis, and personal preferences, but it is important to assist healing and prevent recurrence of the problems. There are many type of exercise that help with strength and flexibility. Yoga, pilates, tai chi, fitness ball workouts, McKenzie Method, and Dynamic Lumbar Stabilization or a combination of these methods may be most effective and can prevent boredom.

• Short rest for a day or two is OK, but extended periods of rest can prolong healing and increase stiffness. Variations on rest may be more successful than complete inactivity by staying active, but avoid positions and activities that aggravate the pain. Sitting or standing for long periods may make the pain worse, so take frequent breaks to walk around or do mild stretching as long as this doesn’t cause back spasms. Often there is a balance that must be found between being stationary too long vs. walking too long. This is quite individual and changes day to day.
• If the pain is due to inflammation, ice or cold packs are helpful reduce the swelling. If the pain is not due to inflammation, heat can improve blood flow to bring nutrients to the injured tissues. A warm bath, hot water bottle, heating pad, or chemical heat wraps can relax tense muscles.
Alternating heat and ice can also be helpful by both reducing inflammation and increasing flexibility and mobility.37

- Over-the-counter pain medications including aspirin, ibuprofen and naproxen have anti-inflammatory properties, so can reduce swelling in addition to dampening the pain.37 Acetaminophen does not reduce inflammation, but it can reduce the sensation of pain.37 When in doubt, an anti-inflammatory is preferable.

- Certain dietary supplements can be beneficial in reducing inflammation, relieving osteoarthritis pain, relaxing muscle tissue, removal of dead tissue and stimulating new tissue growth.46 Specifically, it has been found that bromelain in combination with trypsin and rutin that is useful in healing and pain relief.46, 47, 48 Trypsin and bromelain are an enzymes.46, 47 Rutin is a plant flavonoid.48 Phlogenzym or Wobenzym are the commercial names of the compound of the three supplements. It is widely available online or over-the-counter. The dosage of Wobenzym is quite large, so Phlogenzym is preferred. Both have had reports of gastrointestinal upset in some people.49 Research found that either compound was as effective as diclofenac (NSAID) in relieving back pain.49 Note, there is a topical version of Wobenzym and Phlogenzym, but that is for healing wounds and burns. The oral medication is the type used for low back pain.

- Stretching the muscles in the low back, buttocks, hips, and hamstrings can help manage back pain.37 Do not stretch to a point of pain. Keep stretching within a range that feels like it is doing some good and hold it for brief periods at first, gradually building up to longer times.37 Gentle yoga can help with stretching the back muscles and improving mobility.

- In the case of acute low back pain, muscle strengthening exercises could cause damage by putting extra strain on ligaments and muscles, so it is recommended that strengthening exercises should be avoided during the acute phase of back pain.25 Strengthening the abdominal, hip, and gluteus muscles (core muscles) can help relieve back pain and keep it strong.37 A home program of pilates or guidance by a physical therapist can help build and maintain the muscles needed to support the spine and reduce the chances of reinjury. Strained muscles often occur because the core muscles were weak. Maintaining a daily routine of exercise and strengthening can be very effective.24 Avoid high-impact exercise or activities that involve twisting for at least 6 weeks: jogging, football, golf, ballet, weight lifting, etc.

- As internist Dr. Tim Carey notes, “If there were a pill out there that could reduce your risk of future episodes of back pain by 30%, I’d probably be seeing ads on television every night,” but health care providers do not prescribe it enough.19 Physical activity is free or very cheap in comparison to some incredibly expensive pharmaceuticals which also bring unwanted side effects.19

As noted in the Prevention section above, aerobic exercise provides the benefits of increased blood flow providing nutrients, aiding healing, and reducing stiffness in the low back as well as releasing endorphins which help reduce pain naturally.25 Aerobic exercise also improves functionality by reducing fear of movement, where patients avoid movement when they anticipate it will cause pain.25 Duration of the exercise program and intensity appear to matter. Low intensity aerobic and strength training exercises over a 6-week period both provided 15-20% pain relief (non-significant difference between the two activities).25 Six weeks is not enough to significantly improve aerobic fitness, however. An 8-week program with moderate aerobic exercise combined with physiotherapy or physiotherapy alone resulted in 42-47% reduction in low back pain (non-significant difference between the two groups).25 Improvement in aerobic fitness after the 8-week period was found not to improve significantly despite the increase in intensity and duration of the program.25 Finally, a 12-week high intensity aerobic exercise program involving running on a treadmill was compared to passive treatments with ultrasound.25 There was a 41% reduction
in pain for the high intensity group and no improvement in the ultrasound group. No obese patients were involved in the high intensity group presumably due to risk of injury or other complications.

In conclusion, this research indicates that both physiotherapy involving flexibility, core strength and stabilization, and education or moderate intensity aerobic exercise at 40-60% VO\textsubscript{2max} are effective in reducing low back pain, though these do not significantly increase cortisol levels for additional pain relief.

- Getting enough sleep is important, though back pain may prohibit quality sleep. Using relaxation techniques, finding a good sleeping position and mattress, and other behavioral techniques to make sure that you have the best opportunity to sleep well (eg. cool, quiet, dark bedroom) can help.
- If your work area or hobby areas are not set up properly, this needs to be addressed to allow for good posture, a supported back, good lighting, and reduced stress.
- Low back pain has a large psychological component, so it is important to treat depression and find ways to manage stress. Stress and depression tend to cause muscle tension, so you will recover more quickly if you can remove the things in your life that are disturbing or get help to change your outlook and coping strategies.
- Transcutaneous electrical nerve stimulation (TENS) has been around for a long time and its use for relief of back pain is controversial. Small electrodes are placed in the area of back pain and the device stimulates sensory nerves in the back, creating a tingling sensation that may temporarily reduce the sensation of pain. In general, these units are safe, but may be ineffective. In some people, TENS provides substantial relief and when this is the case, it is safe to use at home on a long-term basis. There are circumstances where TENS should definitely not be used, such as during pregnancy or when wearing a pacemaker. The electrodes may be placed in a location or turned up too high so that increased muscle spasms are experienced. In such cases, the location of the electrodes should be changed and/or the intensity of the stimulation decreased. Some people do find that there is temporary relief from pain, though that usually ends soon after each use.
- Inversion therapy involves the use of a platform that supports a person in an upside down position which theoretically takes the pressure off the nerve roots and disks in the spine. Research has found this type of therapy ineffective for long-term relief, though some people find temporary relief in combination with other treatment options. There are risks involved in the use of inversion tables. The heartbeat slows, blood pressure increases, and the pressure in the eyeballs increases dramatically, so this type of remedy is not advised for people with high blood pressure, heart disease, or glaucoma. Scary stuff aside, inversion therapy can be very relaxing and take the load of gravity off the lower back. Rather than starting with full inversion, it may be better to place the table at 30 or 45 degrees below horizontal and start with just a couple of minutes of inversion. Full inversion should never exceed five minutes at a time, though it is possible to do several inversions of 2 minutes followed by a vertical rest period for 2 minutes, cycling back and forth for several times. Rather than waiting for severe episodes, it can be helpful to do inversion therapy several times every day to maintain muscle relaxation and to counteract the forces of gravity.

Treatment by a health practitioner may be helpful in speeding recovery when pain persists more than a few days.

- Acupuncture. Acupuncture can be very effective in relieving low back pain. Research shows that combining acupuncture with usual care for low back pain is more effective than usual care alone. Relief may be immediate, but may not be lasting. The exact mechanism of how acupuncture works is not well understood and the results may be related to the patient’s
expectations, the deep relaxation experienced during the process, or factors other than the
needling itself.50 Regardless of the source of relief, the general recommendation today is that
acupuncture should be used in cases that do not respond to usual self-care.50

- **Massage.** Research has found that massage may be more beneficial than usual care for low back
  pain.51, 52 Massage sessions of one hour, repeated once weekly for 10 weeks, showed benefit in
  one study. Benefits of massage are not long term, but can be beneficial for several months.51, 52
  The type of massage does not seem to make a difference in the effectiveness (i.e. Swedish,
  therapeutic, etc.).51, 52 Current recommendations include massage as an option for treating acute
  back pain, but not for chronic back pain.52

- **Physical Therapy or Chiropractic Treatments.** Research has found physical therapy and
  chiropractic manipulation to be as effective as self-care methods described above or as simple
  education, though satisfaction with treatment was rated higher with patients who received either
  type of professional care.53, 54 A survey of physical therapists found that most of them managed
  low back pain in patients through education in body mechanics, stretching, strengthening
  exercises, and aerobic exercises.55 Some patients likely feel that they prefer assistance and
  guidance when dealing with low back pain, but in reality this doesn’t change the outcome nor
  speed recovery over the usual self-care treatments. One thing which is probably well worth the
  effort and cost of physical therapy is the “unlearning” of compensating or guarding muscle
  activation which many patients adopt to avoid pain.9 These awkward postures and movements
  can linger long after back pain has been resolved and may result in further injury or reinjury that
  could be avoided with assistance and exercises from someone knowledgeable in body
  mechanics.9 Costs for physical therapy or chiropractic averaged about $430 as opposed to $153
  for the patients who received an educational booklet.53 If you are cost-conscious, self-care is
  likely to be quite effective, but it is important to take an active role in healing and prevention of
  recurring injury.

- **Steroid (cortisone) injections.** When things become severe, steroid injections can help in some
  cases.45 Iontophoresis is a means of delivering steroids through the skin without injection and it
  is especially effective in relieving acute low back pain.41 The steroid is applied to the skin and an
  electrical current is applied that causes the steroid to migrate under the skin.41

- **As mentioned previously, prescription opioids are not effective in improving functioning in
  chronic low back pain patients.** 20

(Updated 5/1/2019)

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All Ergonomics Articles are available online at:
http://working-well.org/articles/archive.html

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# Vertebral Subluxation and Nerve Chart

A Vertebral Subluxation Complex (VSC, Bio-Mechanical Lesion) has numerous components, i.e., osseous (bone), neurological (nerve), connective tissue (muscles, ligaments, and discs), lymphatic, circulatory, biomechanical alterations (curvatures, etc.) and somatic visceral (tissues, organs, etc.) which may cause irritation and/or compression of nerve roots and affect these components. The nervous system controls and coordinates all organs and structures of the human body. Many nerves come from the spinal cord, pass through foramina (holes) formed by notches of 24 vertebrae in the movable spinal column, and innervate specific areas and parts of the body. Whenever specific areas or parts of the body are malfunctioning, generalized and/or specific symptoms are possible.

<table>
<thead>
<tr>
<th>Spinal Nerves</th>
<th>Areas and Parts of Body</th>
<th>Possible Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1C</td>
<td>Back of the head</td>
<td>Headaches (including migraines, aches or pains at the back of the head, behind the ears or in the temples, tension across the forehead, throbbing or pulsating discomfort at the top or back of head)</td>
</tr>
<tr>
<td>2C</td>
<td>Various areas of the head</td>
<td>Jaw muscle or joint aches or pains</td>
</tr>
<tr>
<td>3C</td>
<td>Side and front of the neck</td>
<td>Dizziness, nervousness, vertigo</td>
</tr>
<tr>
<td>4C</td>
<td>Upper back of neck</td>
<td>Soreness, tension and tightness</td>
</tr>
<tr>
<td>5C</td>
<td>Middle of neck and upper part of arms</td>
<td>Feel in back of neck and throat area</td>
</tr>
<tr>
<td>6C</td>
<td>Lower part of neck, arms, and elbows</td>
<td>Pain, soreness, and restriction in the shoulder area</td>
</tr>
<tr>
<td>7C</td>
<td>Lower part of arms, shoulders</td>
<td>Bursitis, tendinitis</td>
</tr>
<tr>
<td>1T</td>
<td>Hands, wrists, fingers,</td>
<td>Pain and soreness in arms, hands, elbows and/or fingers</td>
</tr>
<tr>
<td>2T</td>
<td>Heart, its valves and coronary arteries</td>
<td>Chest pain, tightness or constriction</td>
</tr>
<tr>
<td>3T</td>
<td>Lungs, bronchial tubes, pleura, chest</td>
<td>Asthma, difficult breathing</td>
</tr>
<tr>
<td>4T</td>
<td>Gall bladder, common duct</td>
<td>Middle or lower mid-back pain, discomfort and soreness</td>
</tr>
<tr>
<td>5T</td>
<td>Liver, solar plexus</td>
<td>Venous and numerous symptoms from trouble or malfunctioning of:</td>
</tr>
<tr>
<td>6T</td>
<td>Stomach, mid-back area</td>
<td>Throat</td>
</tr>
<tr>
<td>7T</td>
<td>Pancreas, duodenum</td>
<td>Heart</td>
</tr>
<tr>
<td>8T</td>
<td>Spleen, lower mid-back</td>
<td>Lungs</td>
</tr>
<tr>
<td>9T</td>
<td>Adrenal glands</td>
<td>Gall bladder</td>
</tr>
<tr>
<td>11T</td>
<td>Kidneys, ureters</td>
<td>Liver</td>
</tr>
<tr>
<td>12T</td>
<td>Small intestines, upper/lower back</td>
<td>Stomach</td>
</tr>
<tr>
<td>1L</td>
<td>Ileocecal valve, large intestines</td>
<td>Pancreas</td>
</tr>
<tr>
<td>2L</td>
<td>Appendix, abdomen, upper leg</td>
<td>Spleen</td>
</tr>
<tr>
<td>3L</td>
<td>Sex organs, uterus, bladder, knees</td>
<td>Adrenal glands</td>
</tr>
<tr>
<td>4L</td>
<td>Prostate gland, lower back</td>
<td>Kidneys</td>
</tr>
<tr>
<td>5L</td>
<td>Sciatic nerve, lower legs, ankles, feet</td>
<td>Small and large intestines</td>
</tr>
<tr>
<td>6L</td>
<td>Hip bones, buttocks</td>
<td>Sex organs</td>
</tr>
<tr>
<td>7L</td>
<td>Rectum, anus</td>
<td>Uterus</td>
</tr>
</tbody>
</table>

For further explanation of chart, ask your Doctor of Chiropractic.

Note: This possible symptoms listed on this chart may not be considered to mean that these possible symptoms are caused whenever there is a vertebral subluxation or even by a specific vertebral subluxation. This diagram is used for educational purposes and will not correct all of these conditions.

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