



Back Injuries & Postrehabilitation

INTRODUCTION:

The back is one of the most frequently injured areas of the body. Millions of people suffer from some type of low back pain. Low back pain is a symptom, not a diagnosis. Acute back strain/sprain is the most common injury of the back and is usually attributed to a single incident that involves lifting and twisting. Although a particular event usually preceded the injury, the underlying cause is almost always the result of a lifetime of poor back mechanics. Although people tend to think of back pain as involving discs and nerves, most back pain results from musculoskeletal injuries, and most therapies are directed to this end. More than 25 different musculoskeletal conditions can result in some type of back pain.



The lower back is an extension of the bony spinal column and is composed of five lumbar and five sacral vertebrae stacked on top of each other and separated by a connective tissue complex known as the intervertebral disc. Each vertebra has a body that bears most of the weight and a bony arch. The spinal cord runs through the opening created by the arch. Ligaments and muscles of the back are attached to different parts of the vertebra body and its bony extensions, providing support and strength. Although the individual spinal segments move very little, the spine itself is capable of a considerable range of motion. Much of this motion occurs at particular spinal levels. For example, most of the ability of the back to bend forward and backward takes place at the junction of the lumbar and sacral vertebrae, known as the L5/S1 junction. In addition to the spine's flexibility and strength, it is also exquisitely balanced such that when standing quietly almost no back muscular activity is needed.



The vertebral disc is composed of two types of material. An outer ring of strong connective tissue, called the annulus, surrounds a softer gel-like material called the nucleus pulposus, keeping it restrained to the center of the disc. Throughout the day—because of gravity and other forces—the discs within the spinal column tend to lose water and a person shrinks about 3/4 inch from morning to night. During the night lying down relieves the pressure and water, carrying nutrients, is resorbed back into the disc. As individuals become older their discs tend to become less hydrated in general. This is one reason why many people actually do become less tall as they age.

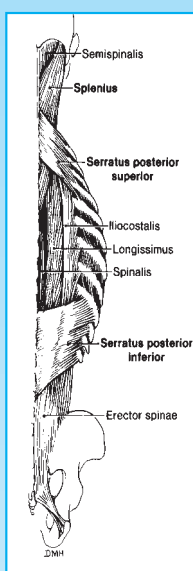
In the lower back, the spinal nerves that carry motor and sensory information to the lower extremities exit the spinal cord by passing out through openings between two vertebrae. When a disc ruptures or herniates, the annulus weakens or actually tears. The gel-like nucleus pulposus then pushes through the path of least resistance and, depending on the damage to the annulus, can squeeze into the space through which the nerve passes. The nerve is then put under pressure, or “pinched.” The pain that you may feel radiating down your leg is the result of this pinching and varies with the exact nerve involved. Nerve root irritations usually involve feelings of a tingling or a “pins and needles” sensation that always follows the same path and involves the same muscles. The exact location depends on the nerve root. Sometimes, areas of decreased sensation can be present. Almost all cases of herniated discs can be treated conservatively with rest, modalities, and stretching/strengthening programs. Annular tears can heal in 6 to 12 weeks, with cells of the body removing damaged portions of the herniated disc.



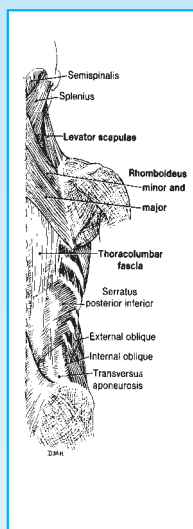


Another important structure in the vertebral column is the facet joint. This is a “paired” joint surrounded by a ligamentous capsule formed when vertebral bony extensions that are directed upward join with the downward extensions of the vertebral body immediately above. There is some evidence that the facet joints may separate slightly during bending and over time gradually lose their fit, especially with improper bending and back mechanics. Much current research is being directed to determining the contribution of this joint to back pain, the degree of laxity that develops over time, and methods of treatment. However, the best treatment is appropriate prevention.

There are several layers of muscles extending across various levels of the vertebral bodies. The smallest muscles run between 1 or 2 different vertebrae; the largest can span almost the entire column. The deep muscles make up the bulk of the mid back muscles, called the paraspinal muscles, and are frequently injured in muscle strains. The annular fibers of the disc, the paraspinal musculature, ligaments within the spinal column, ligaments between the spinal column and the pelvis, and the facet joint capsules may be injured singly or in any combination. Regardless of the site of injury the back tends to respond in a similar manner—the musculature of the low back goes into spasm in an attempt to splint or restrict the movement of the injured region. Sometimes the spasm is so intense it causes a listing to one side. Soft tissue contractures may develop if this spasm is allowed to persist and pain can become a chronic problem.



In the past, there was a feeling that almost all back injuries involved the disc to some degree. This led to the concept of prolonged bed rest to facilitate healing. **THIS VIEW IS NOW INCORRECT.** Only in extreme cases should partial bed rest be used; the best thing is to get up and move as much as possible, even if only for short periods of time. Bed rest has debilitating effects on all aspects of body functioning. Muscle strength and flexibility are measurably decreased after only 4 days of inactivity.



Most back pain is not as clear-cut as having a herniated disc pushing on a nerve. In many cases the exact cause of the pain cannot be determined and individuals are diagnosed as having a generic “low back sprain.” Regardless of the cause, most back injuries respond to conservative care activity in conjunction with a back strengthening program. Modalities, primarily heat, have proven very useful in the treatment of back pain, especially when associated with paraspinal muscle spasm. Exercise programs need to be incorporated at the right time and at the right intensity to complement appropriate healing of the injured tissue. This is when the expertise of a health care provider is most needed.

The programs described in this manual are three separate back programs. The therapist will decide which combination of therapies is best suited to your injury; do only the exercises selected. Note any difficulties or unusual sensations you may experience for discussion with the therapist or physician. If you have an exacerbation or flare-up of symptoms, decrease either the number of repetitions or the frequency of exercise until you can discuss the matter with the therapist.

This book was designed to improve the ability of individuals to engage in self-directed exercise and therapy programs. Although they can be used in conjunction with a medical physician, physical therapist, personal trainer, or exercise physiologist, they are also adequate for self-study and application. The exercises are illustrated and described in visually appealing detail. They also provide a wide range of stretches and exercises that can be tailored to almost any condition, frequent or rare.

Self-care and rehabilitation are synonymous. Rehabilitation has more medical connotations, but someone does not need a medical condition to begin taking better care of themselves. Many of the conditions seen by physicians can be alleviated or substantially decreased through diligence with a home stretching or exercise program. This is becoming more important as people engage in jobs that overuse only a few muscles, for example, computer operators who maintain static positions of their neck, shoulder and arms for possibly an entire work day. Likewise, weekend warriors—whether they are doing battle on the ball field or the front lawn—frequently suffer from pain generated by strained muscles or ligaments that have been dormant the remaining six days of the week.

As with any exercise program, the input of a physician is necessary if an individual suffers from any type of chronic condition, e.g. heart disease, osteoporosis, diabetes, or chronic obstructive pulmonary disease. This is especially important if someone is just beginning a program after many years of sedentary activity. If there is any type of heart condition, you need to consult a physician before engaging in even the simplest of activities. Never underestimate the damage done by years of neglect or lack of activity.

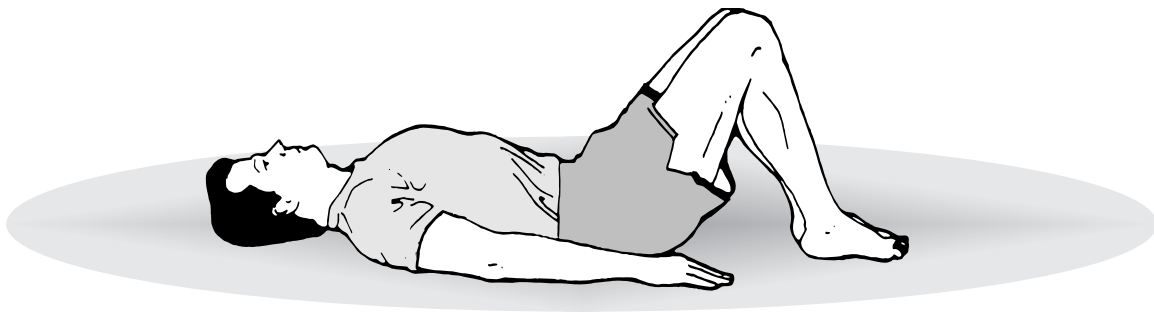
The goal of this book, as with any approach to human health, is to promote a balance between the external environment and the internal body. Life is an interaction between mind, body and soul, that is shaped and influenced by job, family, and lifestyle. The latter has been sadly influenced to a large degree by television, time restraints, and commodities designed for a fast-paced existence. However, there is no short-cut to health. The good news is that very little time is required to maintain long term and cumulative gains. All that is needed is dedication, encouragement and the realization that everything that is done, no matter how minimal an effort, can add up to years of energy, relaxation, and improved health. I hope this book can contribute in some way to that path and outcome.

LEVEL I: NEUTRAL BACK

Neutral back position refers to the position you are in when your back is causing the least amount of pain. Find your neutral back position while lying on your back with your knees bent, as shown in the illustration. This is accomplished by slowly arching and relaxing your back, trying to find a pain free position of relaxation between these two extremes, termed the neutral position. After you find your neutral position tighten your abdominal muscles. You should not experience any pain. If you do, then you are not yet in your neutral position. After you have found your neutral position, and before proceeding, practice the breathing exercises described at the end of this manual. It is important to not hold your breath during any of these exercises. The neutral back program is a combination of stretching and strengthening.

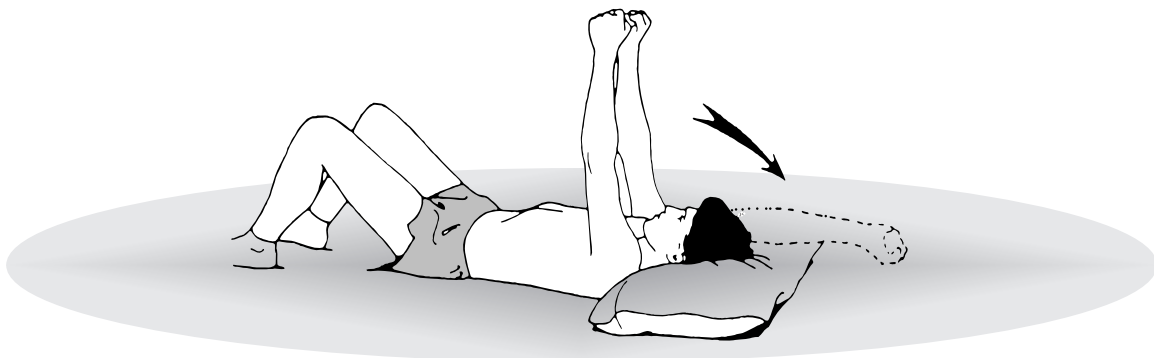
Exercise 1

Figure 1. Neutral back position. After you have comfortably attained this position begin with isometric exercises of the gluteal muscles. Maintain your neutral back position with your knees bent. Tighten the muscles in your buttocks and hold them taut for 10 seconds, then release. Continue this process of tightening and releasing.



Exercise 2

Figure 2. Neutral back with arm lifts. Maintain your neutral back position with your knees bent. Slowly lift your arm overhead (do not swing your arm), moving it in a steady arc until you have reached as far overhead as you can. Hold it in this position for 5 seconds, and then slowly bring it back to your side. Repeat this for the other arm, and continue alternating in this pattern. You may need to use a pillow or a thick towel to minimize the discomfort of the floor on your shoulder.



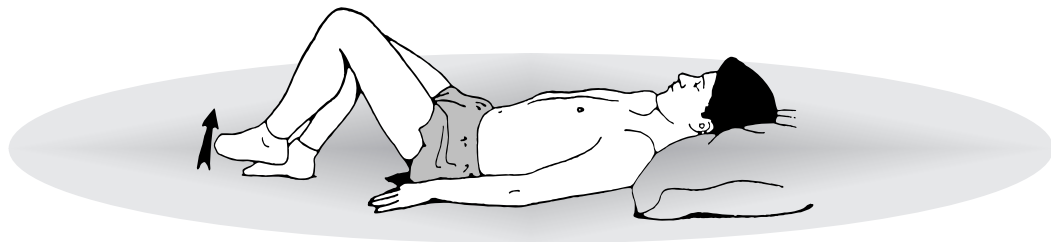
Exercise 3

Figure 3. One leg slides. Assume your neutral back position with your knees bent. Slowly slide one heel away from your body until your leg is straight, then slide it back to neutral position. Repeat this for the opposite side.



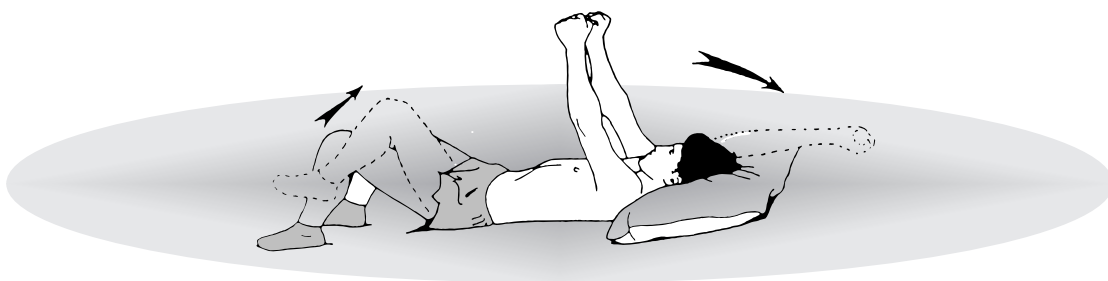
Exercise 4

Figure 4. Marching. Maintain your neutral position, with your knees bent. Lift one foot approximately 5-6 inches above the ground over 5 seconds, hold this for 5 seconds, and slowly lower your foot. Repeat this for the opposite side.



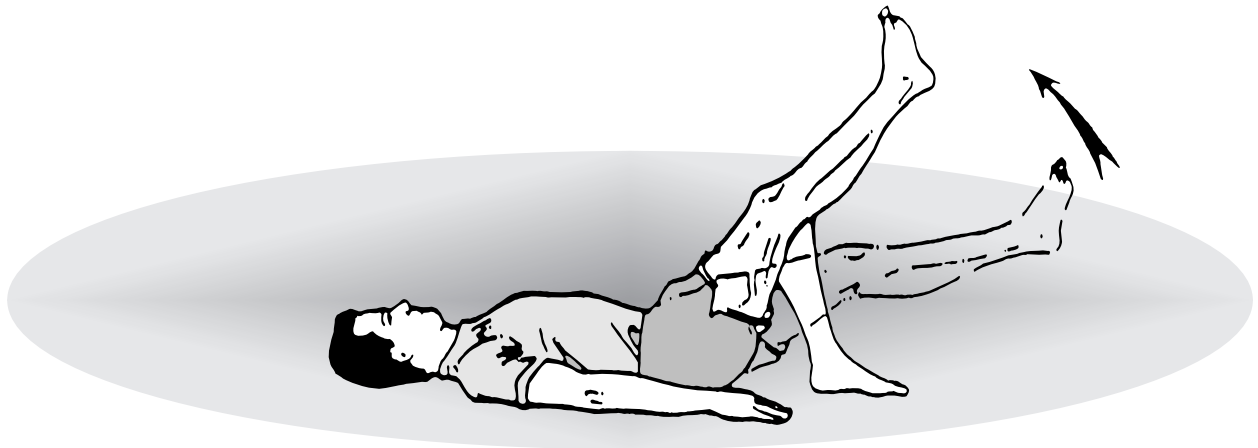
Exercise 5

Figure 5. Marching with hand raising. Maintain your neutral position with your knees bent. Lift one foot approximately 5-6 inches above the ground over 5 seconds, hold this for 5 seconds, and slowly lower your foot. At the same time you are raising your foot, swing the arm of your opposite side above your head as you did for the exercise in figure (2), then bring your arm down as you lower your leg. Repeat this using your other leg, raising the arm on the opposite side of your body and bringing it down as you lower your leg.



Exercise 6

Figure 6. *Straight leg raises.* Maintain your neutral position with your knees bent. Straighten one leg into the air over 5 seconds, hold this for 5 seconds and then lower your leg back to the bent leg neutral position. Repeat this for the opposite side.

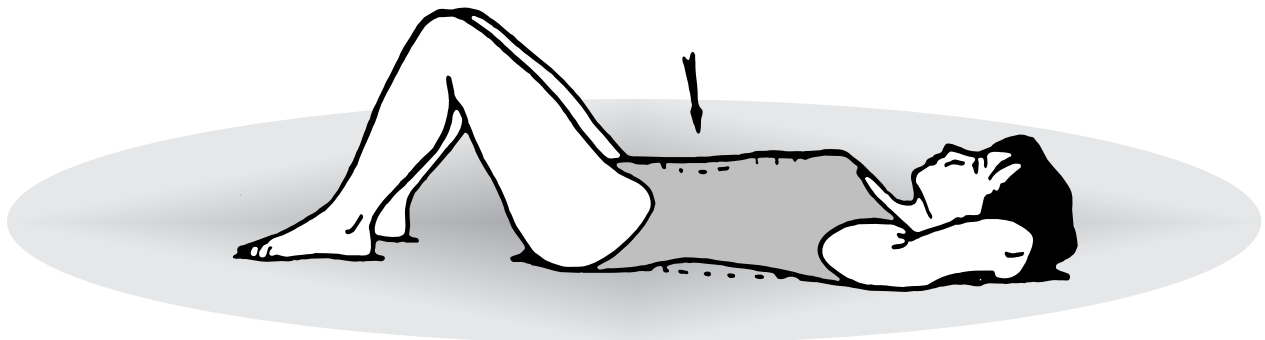


LEVEL II: WILLIAMS FLEXION

Williams flexion exercises decrease the compressive load to the posterior intervertebral disc and also open the intervertebral foramen. These exercises consist of 4 stretching activities, exercises 7-10, and 4 strengthening activities, exercises 11-14.

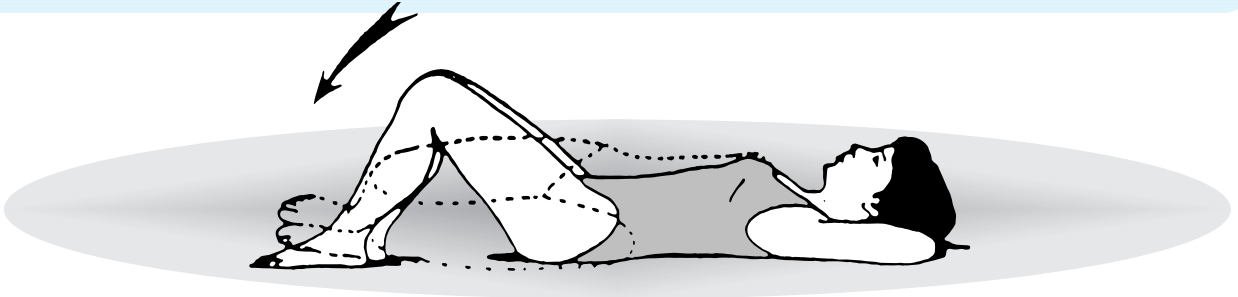
Exercise 7

Figure 7. *Back tightening.* In this exercise try to push the small of your back into the floor, flattening your back throughout its length. Keep your hands together, underneath your head.



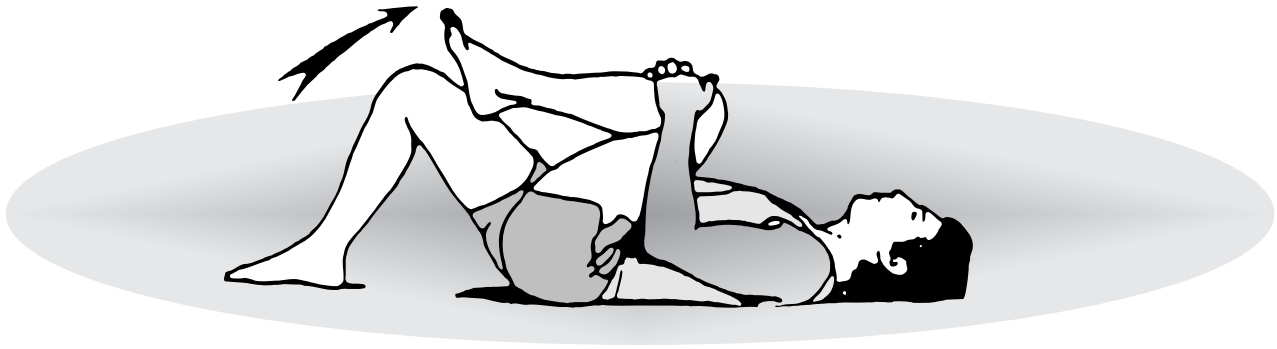
Exercise 8

Figure 8. Lower trunk rotation. After you have brought yourself into the flat-back position of exercise 7, slowly rotate your knees and legs as far over to one side as possible (keep your knees together), hold this position for 5 seconds and then slowly return to midline. Alternate sides and bring your knees just as far over to the other side. Rest your hands underneath your head.



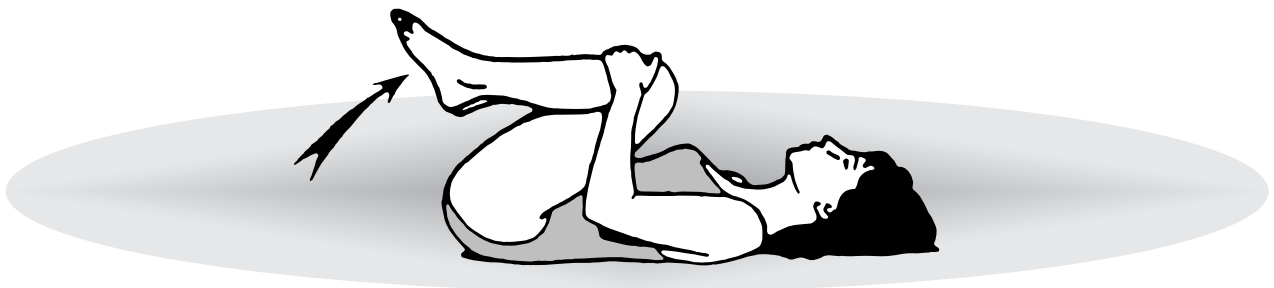
Exercise 9

Figure 9. Single knee-to-chest stretch. Lay on a hard surface, such as the floor. Pull one knee to your chest until you feel a stretch in the buttocks and lower back. Hold this for 5 seconds. Repeat for the opposite leg.



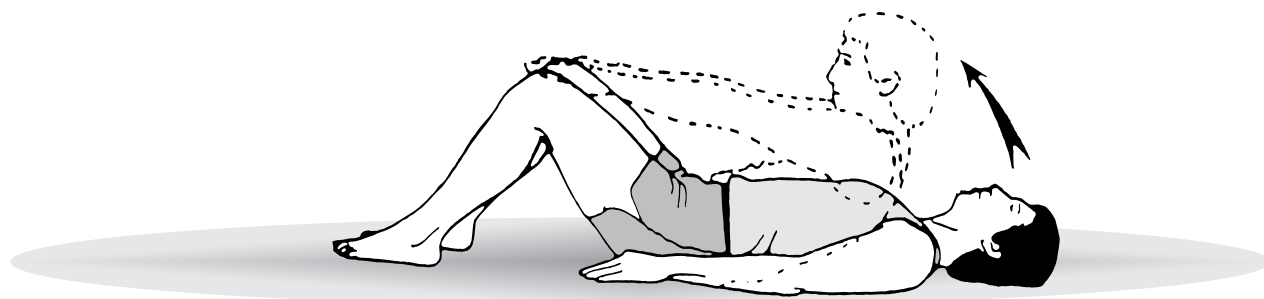
Exercise 10

Figure 10. Double knee-to-chest stretch. Lay on a hard surface, such as the floor. Pull both knees to your chest until you feel a comfortable stretch in the buttocks and lower back. Hold this for 5 seconds, and then slowly return your legs to the floor.



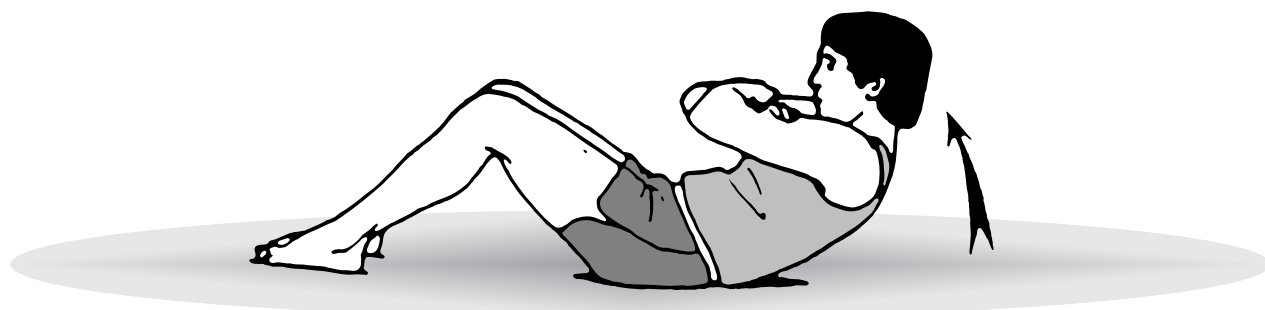
Exercise 11

Figure 11. *Straight curl-ups.* Assume your neutral back position with your hands resting at your side. Slowly rise straight up and touch your hands to your knees, hold them at your knees for 5 seconds and then slowly lower yourself to the floor. Do not jerk yourself up. If you cannot touch your knees initially then reach as far as you can, and work toward a goal of touching your knees.



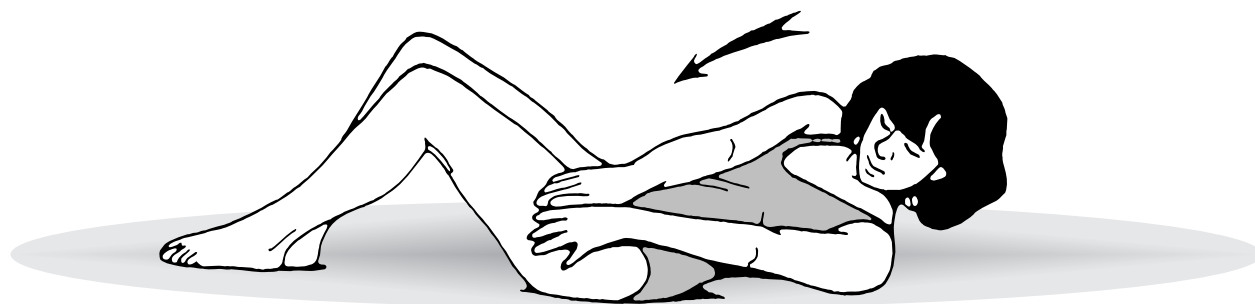
Exercise 12

Figure 12. *Folded arm curl-ups.* Maintain your neutral back position and cross your arms on your chest. Curl-up until your head, neck, shoulders, and mid back are off the floor. Your low back should still maintain floor contact. Hold this position for 5 seconds, then slowly lower your body back to the floor.



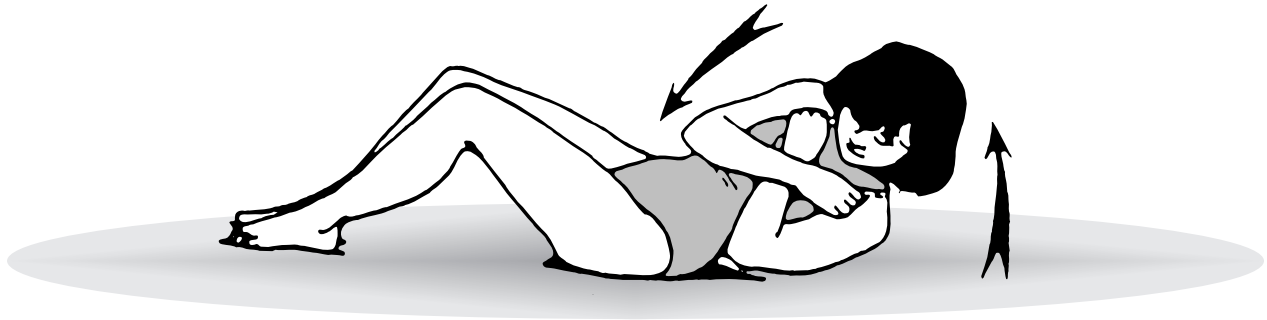
Exercise 13

Figure 13. *Diagonal curl-ups I.* Maintain your neutral position with your hands coming together on your midline between your legs. Slowly raise your head and shoulders and rotate to one side, try to bring your hands down to the floor next to your hip. Hold this position for 5 seconds, then slowly lower your body back to the floor. Repeat this for the opposite side.



Exercise 14

Figure 14. Diagonal curl-ups II. Maintain your neutral position and fold your arms across your chest as shown in the illustration. Slowly raise your head and shoulders and rotate to one side. Curl-up until your head, neck, shoulders, and mid back are off the floor. Your low back should still maintain floor contact. Hold this position for 5 seconds, then slowly lower your body back to the floor. Repeat this for the opposite side.

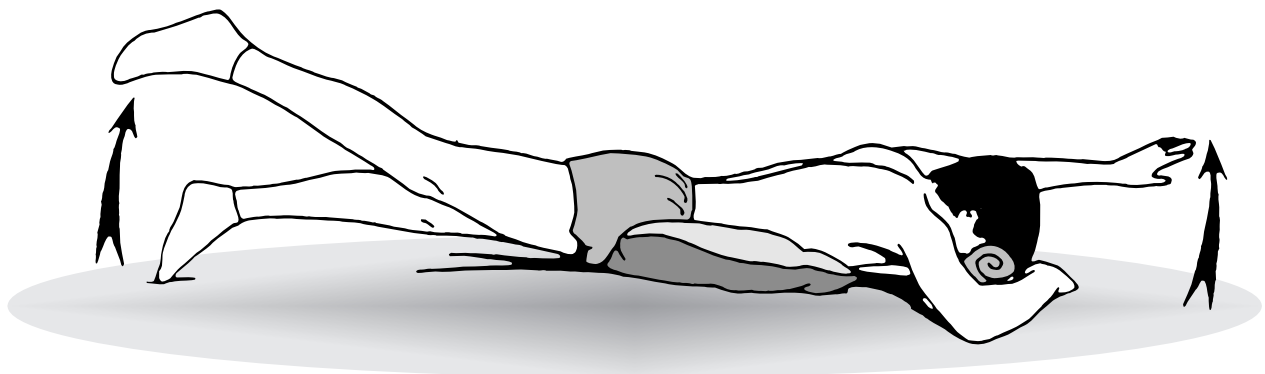


LEVEL III: EXTENSION EXERCISES

This section is designed to stretch and strengthen the back extensor musculature. Rather than isolating specific muscles, these exercises address groups of muscles in the back, buttock, and upper leg.

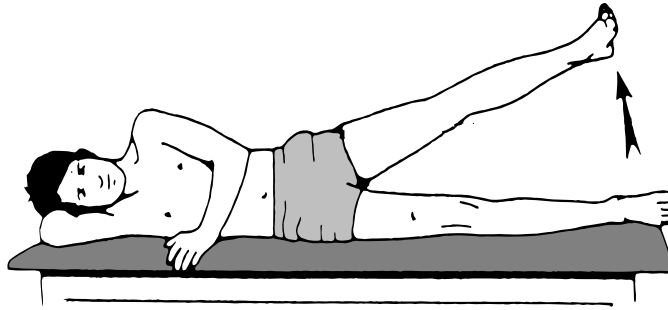
Exercise 15

Figure 15. Prone leg raises and arm extension. These are performed lying on the floor on your stomach. You may wish to place a pillow under your abdomen and also a small pillow or thick towel under your forehead. Do not hyperextend your neck. First reach above your head with one arm, bringing it up in a sweeping, arc-like motion; do this several times. Repeat this for the other arm. After you have loosened up, lift this arm with the opposite leg, for example, lift your left arm with your right leg. Repeat this using your right arm with your left leg.



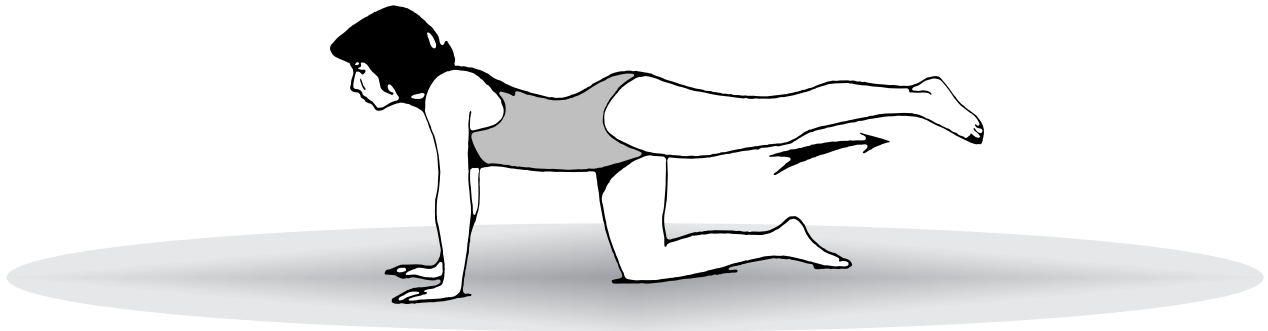
Exercise 16

Figure 16. Leg Lifts. Lay on one side with your hand under your head. Take 5 seconds to raise your leg, hold it in position for 5 seconds, and lower it over 5 seconds. Try not to move your back or pelvis. After you have completed the required number of leg lifts for that side, roll onto the other side and do the same number of leg lifts.



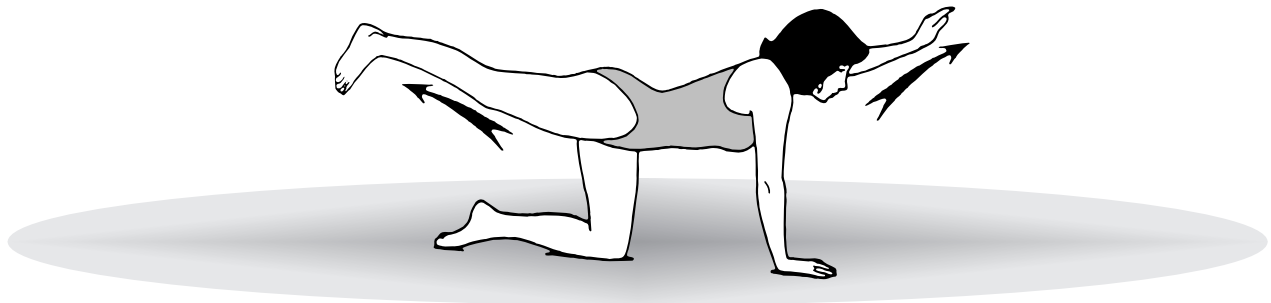
Exercise 17

Figure 17. Leg Straightening. Straighten out your leg until it is in the position shown in the illustration. Hold it in this position for 5 seconds, and lower it over 5 seconds. Repeat for the opposite leg.



Exercise 18

Figure 18. Leg and Arm Straightening. Lift your left arm with your right leg, bringing both your arm and leg straight out from your body so that they are parallel to the floor. Hold this position for 5 seconds. Repeat this exercise using the opposite limbs, lifting your right arm with your left leg.



ADDITIONAL EXERCISES

In patients with poor back function, the hips tend to flex earlier in forward bending. This affects the spinal musculature and is the reason many low back exercise programs also emphasize hip mechanics. The hamstring muscles, which you can feel behind the upper leg when performing squats, can contribute to either injury or recovery. The hamstrings extend from the pelvis to the lower leg, crossing the knee joint. If excessively tight, as is usually the case, they can pull the pelvis forward, flattening the lower back and decreasing its natural lordotic curve. These muscles need to be limber so that the back and hip can move normally. Likewise, the muscles that help rotate the leg attach from the pelvis to the upper leg bone. Again, tightness of these muscles can restrict the motion of the pelvis, decreasing the natural movement of the back. In short, proper back motion requires pelvic flexibility and a program will most likely include stretching and strengthening of these muscles. A separate manual is available for lower extremity stretches.

HOME MODALITIES

You may use heat or ice at home. You can purchase professional cold packs that are kept in a refrigerator. A package of frozen peas works just as effectively. In either case, place a damp towel between the cold pack and the skin. After you stretch or exercise, or for general pain relief, keep the cold pack on the affected area for 20 minutes, then off for 20 minutes. Repeat this for two to three sessions for a total of 60 minutes of cold treatment.

You can also fill small paper cups with water and freeze them. These are nicknamed “ice-popsicles” and are used by holding them in one hand and rubbing over the painful area in the direction of the muscle fibers, peeling away the paper as the ice melts. The therapist may recommend three phases to the home exercise program; (1) apply heat to the back before stretches and exercises; (2) proceed with exercise, and (3) finish with either heat or cold treatment.

Some people cannot tolerate ice and prefer heat usually applied using a heating pad. Again, 20 minutes on and 20 minutes off is an appropriate schedule. Another option is to alternate ice and heat. Ice will be more effective in reducing swelling and providing pain relief but if it is not comfortable heat can also provide some benefits. However, in some cases heat may be harmful, so you need to check first with the therapist.

ACUPRESSURE FOR TRIGGER POINTS

A trigger point is a tender circular or rope-like area of muscle that you can feel within the surrounding muscle. Pressing on this area causes pain, and you may also be able to actually roll a piece of tight muscle under your fingers. These areas are common in back injuries and may develop anytime during rehabilitation. You or someone else, can apply direct pressure for at least 45-60 seconds over the tender point and then gently massage the muscle in the direction of the muscle fibers. A helpful aid is the “ice popsicle” described above. The cup can be held while the ice surface is pressed into the tender area. These points can recur, but consistent self-treatment can alleviate the majority of the discomfort. A tennis ball pressed between the wall and the area of discomfort can also be helpful.

BREATHING

Breathing is a natural pattern that can be utilized to provide additional comfort during the exercise program. Learning to breathe deeply and slowly helps you relax during exercises and stretches. Following is a script to help you breathe more appropriately.

“Begin by first noticing your breathing pattern before you start your program. Take in a deep breath, relax, and exhale all the air you possibly can. Do not force yourself to over-breathe on your inhaled breaths, but do try to empty your lungs as much as possible when you exhale. Do this in a rhythmic pattern before, during, and after either stretching or strengthening. This pattern of breathing will soon become more natural and you will find that it not only helps you deal with any discomfort that is part of your exercise program, but can also be used as a relaxation aid during the day, before sleep, or in periods of high stress.”

SCRIPTS

- "Inappropriate back mechanics and poor posture for extended periods of time are common causes of back pain. The therapist will demonstrate appropriate body and lifting mechanics. One of the most important skills to master is correct lifting techniques. The first step does not involve any muscles: Think about what you are lifting. If it is too heavy get someone to assist you. If you feel you can lift an object, place yourself as close as possible and ensure good footing. Bend more at your knees than at your waist. You can incorporate a small bend at your waist but don't bend excessively, the idea is for your legs to do most of the work. Take in a deep breath, push your pelvis under your body and tighten your stomach muscles. These actions help to support your back. Grab the object and try to hug it close to your body, lean back to balance the load and lift by straightening your leg muscles. The farther away from your body an object is placed, the more stress it places on your back. Lift in a steady motion and avoid sudden jerks. Always turn by moving your feet, never twist at your knees and try to minimize twisting your hips."

- "Adherence to your back program will minimize both the frequency and intensity of recurrent, painful episodes. Additional considerations involve using a lumbar support cushion at home, at work, and when driving for long periods. It is also helpful to restore the normal lordotic curve to your back by standing upright and bending backwards five to ten times. This activity is especially important during extended periods of sitting at a desk or in a car. If you persist in activities that force the low back out of its normal lordotic curve, you run the risk of recurring back pain. It is also important that you stretch the muscles in your lower extremity before beginning activities that may stress your back."

- "An aerobic exercise program of walking or bicycling (either stationary or moving) will also help minimize recurrent pain, as well as contribute to an overall improvement in health. Check with your physician before starting any exercise program. An appropriate plan, especially if you have been relatively inactive, is to start with six brisk, 30-minute walks a month. Almost anyone can incorporate this into his or her monthly schedule, and recent studies have shown that even such a minimal improvement in aerobic exercise can lead to substantial improvements in long term health."

- "Although these are simple preventive techniques, some people may not like the idea of stopping so frequently during a trip, or interrupting their activities during the day. These exercises, as well as any other techniques demonstrated by your therapist, are only effective if incorporated into your lifestyle. Back pain is preventable, but it requires some effort and vigilance. Good posture, appropriate lifting, and a daily stretching and strengthening program are simple but effective ways to minimize discomfort and injury, limited only by your initiative. Since it is generally accepted that back injuries are the result of a lifetime of improper consideration to the mechanics of the back, it is never too soon to begin correcting bad habits."

DISCLAIMER NOTICE:

These manuals are presented only as a summary of information for health care providers involved in the rehabilitation of musculoskeletal conditions. No standard of care is stated or implied. These manuals are not intended nor properly used as a substitute for treatment, only as an adjunct to aid clinical expertise. The exact protocol and progress employed is the determination of the health care provider who assumes all responsibilities for its application.

EXERCISE LOG:

Record your progress in the log below, noting the number of repetitions or sets of each exercise completed. Record any additional notes you may wish to discuss with the therapist or physician.

EXERCISE	DATE	DATE	DATE	DATE	DATE	DATE	DATE	NOTES

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