

## Flexibility

*Flexibility refers to the range of movement of a joint.*

Flexibility is a component of physical fitness. Developing and maintaining it are important parts of a fitness program. Good flexibility can help a soldier accomplish such physical tasks as lifting, loading, climbing, parachuting, running, and rappelling with greater efficiency and less risk of injury.

Flexibility is the range of movement of a joint or series of joints and their associated muscles. It involves the ability to move a part of the body through the full range of motion allowed by normal, disease-free joints.

No one test can measure total-body flexibility. However, field tests can be used to assess flexibility in the hamstring and low-back areas. These areas are commonly susceptible to injury due, in part, to loss of flexibility. A simple toe-touch test can be used. Soldiers should stand with their legs straight and feet together and bend forward slowly at the waist. A soldier who cannot touch his toes without bouncing or bobbing needs work to improve his flexibility in the muscle groups stretched by this test. The unit's Master Fitness Trainer can help him design a stretching program to improve his flexibility.

Stretching during the warm-up and cool-down helps soldiers maintain overall flexibility. Stretching should not be painful, but it should cause some discomfort because the muscles are being stretched beyond their normal length. Because people differ somewhat anatomically, comparing one person's flexibility with another's should not be done. People with poor flexibility who try to stretch as far as others may injure themselves.

### Stretching Techniques

Using good stretching techniques can improve flexibility. There are four commonly recognized categories of stretching techniques: static, passive, proprioceptive neuromuscular facilitation (PNF), and ballistic. These are

described here and shown later in this chapter.

#### STATIC STRETCHING

Static stretching involves the gradual lengthening of muscles and tendons as a body part moves around a joint. It is a safe and effective method for improving flexibility. The soldier assumes each stretching position slowly until he feels tension or tightness. This lengthens the muscles without causing a reflex contraction in the stretched muscles. He should hold each stretch for ten seconds or longer. This lets the lengthened muscles adjust to the stretch without causing injury.

The longer a stretch is held, the easier it is for the muscle to adapt to that length. Static stretching should not be painful. The soldier should feel slight discomfort, but no pain. When pain results from stretching, it is a signal that he is stretching a muscle or tendon too much and may be causing damage.

#### PASSIVE STRETCHING

Passive stretching involves the soldier's use of a partner or equipment, such as a towel, pole, or rubber tubing, to help him stretch. This produces a safe stretch through a range of motion he could not achieve without help. He should talk with his partner to ensure that each muscle is stretched safely through the entire range of motion.

#### PNF STRETCHING

PNF stretching uses the neuromuscular patterns of each muscle group to help improve flexibility. The soldier performs a series of intense contractions and relaxations using a partner or equipment to help him stretch. The PNF technique allows for greater muscle relaxation following each contraction and increases the soldier's ability to stretch through a greater range of motion.

*The four categories of stretching techniques are static, passive, proprioceptive neuromuscular facilitation (PNF), and ballistic.*

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## BALLISTIC STRETCHING

Ballistic, or dynamic, stretching involves movements such as bouncing or bobbing to attain a greater range of motion and stretch. Although this method may improve flexibility, it often forces a muscle to stretch too far and may result in an injury. Individuals and units should not use ballistic stretching.

### FITT Factors

Commanders should include stretching exercises in all physical fitness programs.

The following FITT factors apply when developing a flexibility program.

**Frequency:** Do flexibility exercises daily. Do them during the warm-up to help prepare the muscles for vigorous activity and to help reduce injury. Do them during the cool-down to help maintain flexibility.

**Intensity:** Stretch a muscle beyond its normal length to the point of tension or slight discomfort, not pain.

**Time:** Hold stretches for 10 to 15 seconds for warming up and cooling down and for 30 seconds or longer to improve flexibility.

**Type:** Use static stretches, assumed slowly and gradually, as well as passive stretching and/or PNF stretching.

### Warm-Up and Cool-Down

The warm-up and cool-down are very important parts of a physical training session, and stretching exercises should be a major part of both.

## THE WARM-UP

Before beginning any vigorous physical activity, one should prepare the body for exercise. The warm-up increases the flow of blood to the muscles and tendons, thus helping reduce the risk of injury. It also increases the joint's range of motion and positively affects the speed of muscular contraction.

A recommended sequence of warm-up activities follows. Soldiers should do these for five to seven minutes before vigorous exercise.

- Slow joggin-in-place or walking for one to two minutes. This causes a gradual increase in the heart rate, blood pressure, circulation, and increases the temperature of the active muscles.
- Slow joint rotation exercises (for example, arm circles, knee/ankle rotations) to gradually increase the joint's range of motion. Work each major joint for 5 to 10 seconds.
- Slow, static stretching of the muscles to be used during the upcoming activity. This will "loosen up" muscles and tendons so they can achieve greater ranges of motion with less risk of injury. Hold each stretch position for 10 to 15 seconds, and do not bounce or bob.
- Calisthenic exercises, as described in Chapter 7, to increase the intensity level before the activity or conditioning period.
- Slowly mimic the activities to be performed. For example, lift a lighter weight to warm-up before lifting a heavier one. This helps prepare the neuromuscular pathways.

*The warm-up warms the muscles, increasing the flow of blood and reducing the risk of injury.*

## THE COOL-DOWN

The following information explains the importance of cooling down and how to do it correctly.

- Do not stop suddenly after vigorous exercise, as this can be very dangerous. Gradually bring the body back to its resting state by slowly decreasing the intensity of the activity. After running, for example, one should walk for one to two minutes. Stopping exercise suddenly can cause blood to pool in the muscles, thereby reducing blood flow to the heart and brain. This may cause fainting or abnormal rhythms in the heart which could lead to serious complications.
- Repeat the stretches done in the warm-up to help ease muscle tension and any immediate feeling of muscle soreness. Be careful not to overstretch. The muscles are warm from activity and can possibly be overstretched to the point of injury.
- Hold stretches 30 seconds or more during the cool-down to improve flexibility. Use partner-assisted or PNF techniques, if possible.

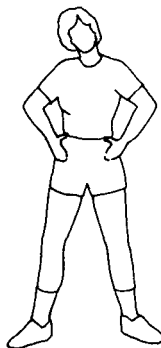
The soldier should not limit flexibility training to just the warm-up and cool-down periods. He should sometimes use an entire PT session on a "recovery" or "easy" training day to work on flexibility improvement. He may also work on it at home. Stretching is one form of exercise that takes very little time relative to the benefits gained.

## Rotation Exercises

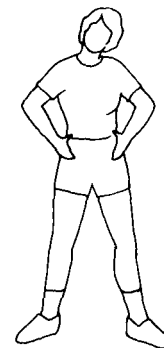
Rotation exercises are used to gently stretch the tendons, ligaments, and muscles associated with a joint and to stimulate lubrication of the joint with synovial fluid. This may provide better movement and less friction in the joint.

The following exercises should be performed slowly.

## NECK

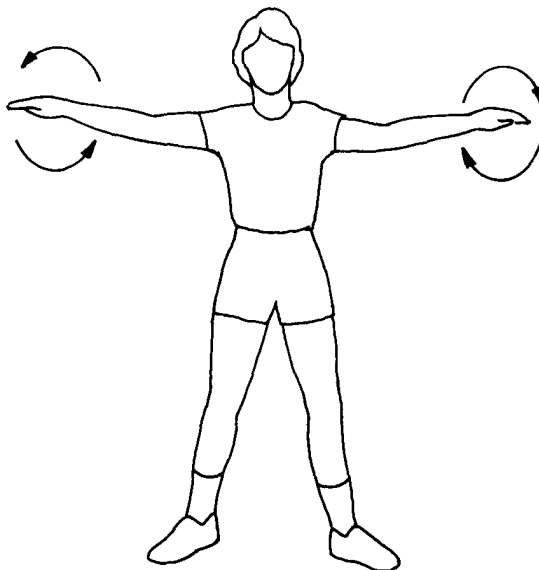


**Position:** Stand with the back straight and feet shoulder width apart. Place the hands on the hips.



**Action:** Roll the head slowly to the left, making a complete circle with the path of the head. Do this three times in each direction.

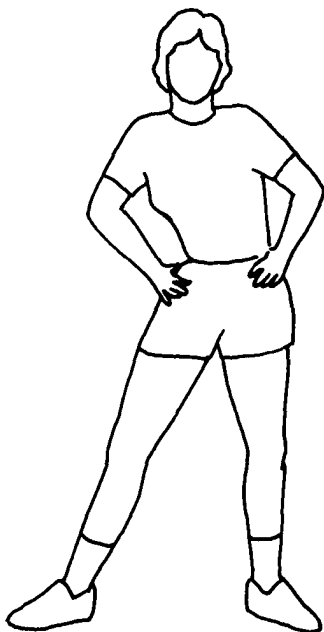
## ARMS AND SHOULDERS



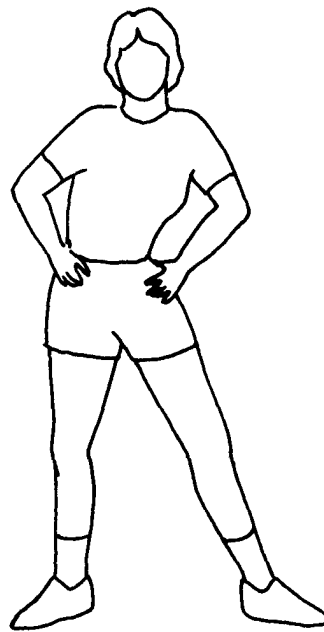
**Position:** Stand with the back straight and feet shoulder width apart. Extend the arms outward to shoulder height.

**Action:** Rotate the shoulders forward, and make a large circular motion with the arms. Repeat the action in the opposite direction. Do this three times in each direction.

## HIPS

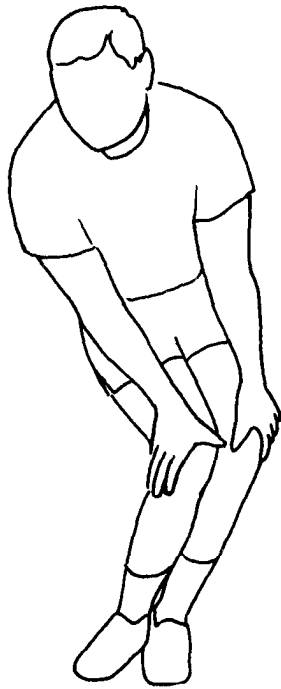


**Position:** Stand in the same manner as for the neck rotation.

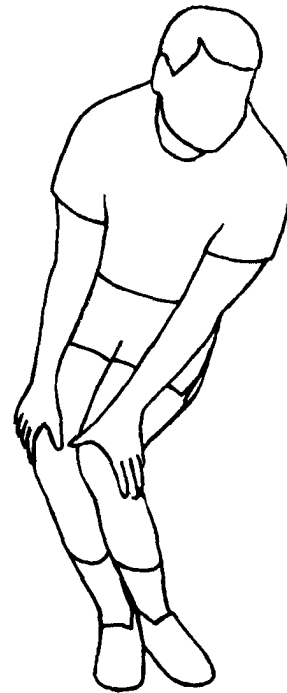


**Action:** Rotate the hips clockwise while keeping the back straight. Repeat the action in a counterclockwise direction. Do this three times in each direction.

## KNEES AND ANKLES



**Position:** Stand with the feet together, and bend at the waist with the knees slightly bent.



**Action:** Place the hands above the knees, and rotate the legs in a clockwise direction. Repeat the action in a counterclockwise direction. Do this three times in each direction.

### Common Stretching Exercises

The following exercises improve flexibility when performed slowly, regularly, and with gradual progression. Static, passive and PNF stretches are shown.

**CAUTION** Some of these exercises may be difficult or too strenuous for unfit or medically limited soldiers. Common sense should be used in selecting stretching exercises.

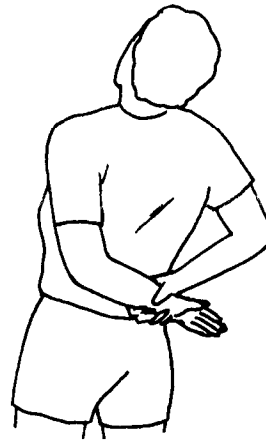
### STATIC STRETCHES

Assume all stretching positions slowly until you feel tension or slight discomfort. Hold each position for at least 10 to 15 seconds during the warm-up and cool-down. Developmental stretching to improve flexibility requires holding each stretch for 30 seconds or longer.

Choose the appropriate stretch for the muscle groups which you will be working.

## NECK AND SHOULDER STRETCH

This stretches the sternocleidomastoid, pectoralis major, and deltoid muscles.

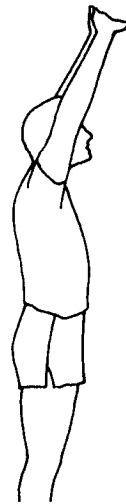
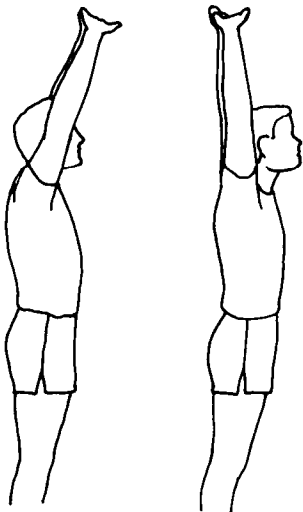


**Position:** Stand with the feet shoulder width apart and the arms behind the body.

**Action:** Grasp the left wrist with the right hand. Pull the left arm down and to the right. Tilt the head to the right. Hold this position for 10 to 15 seconds. Repeat the action with the right wrist, pulling the right arm down and to the left. Tilt the head to the left.

## ABDOMINAL STRETCH

This stretches the abdominals, obliques, latissimus dorsi, and biceps.



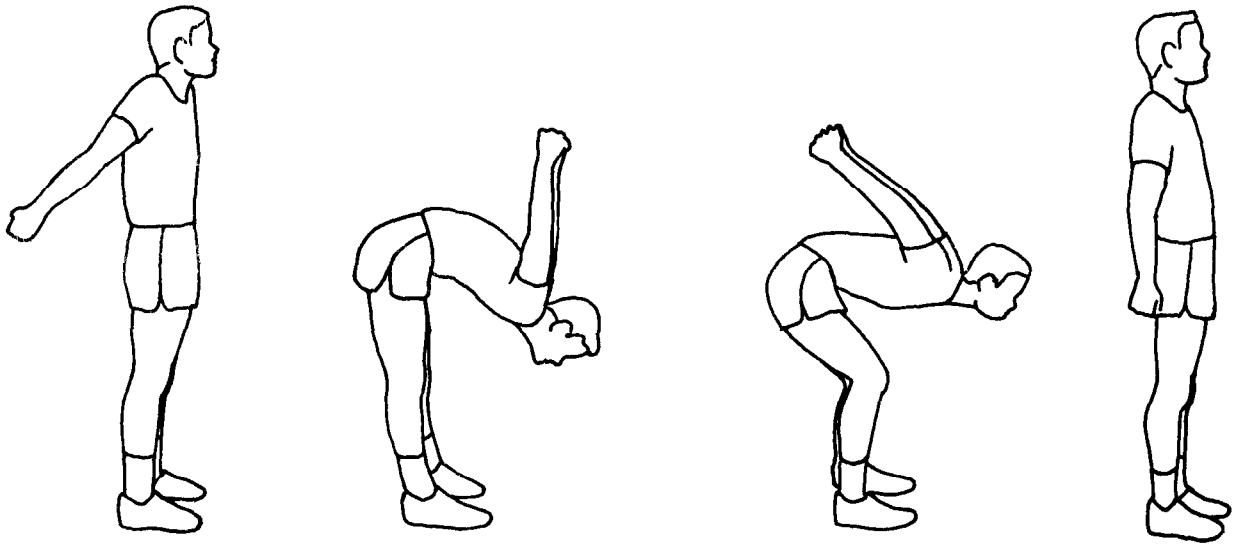
**Position:** Stand and extend the arms upward and over the head. Interlace the fingers with the palms turned upward.

**Action:** Stretch the arms up and slightly back. Hold this position for 10 to 15 seconds.

**Variation:** This stretches the rectus abdominis muscles. Stretch to one side, then the other. Return to the starting position.

## CHEST STRETCH

This stretches the pectoralis major, deltoids, and biceps muscle groups.

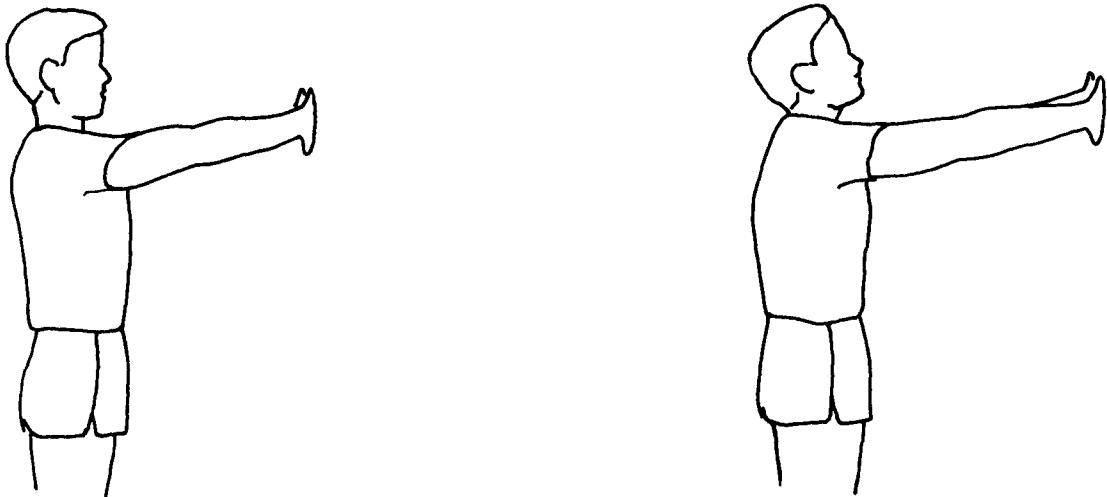


**Position:** Stand and interlace the fingers behind the back.

**Action:** Lift the arms behind the back so that they move outward and away from the body. Lean forward from the waist. Hold this position for 10 to 15 seconds. Bend the knees before moving to the upright position. Return to the starting position.

## UPPER-BACK STRETCH

This stretches the lower trapezius and posterior deltoid muscles of the upper back.

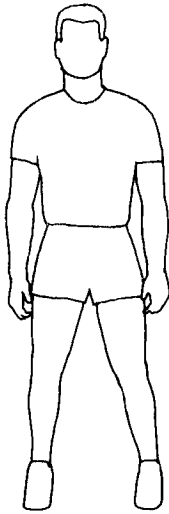


**Position:** Stand with the arms extended to the front at shoulder height with the fingers interlaced and palms facing outward.

**Action:** Extend the arms and shoulders forward. Hold this position for 10 to 15 seconds. Return to the starting position.

## OVERHEAD ARM PULL

This stretches the external and internal obliques, latissimus dorsi, and triceps.

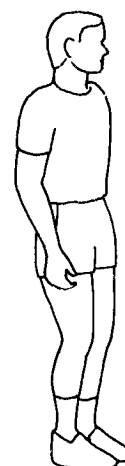
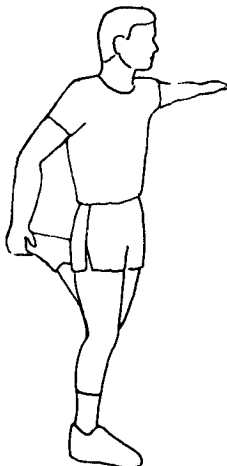
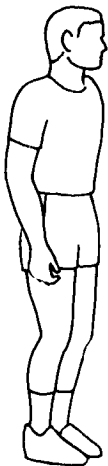


**Position:** Stand with the feet shoulder width apart. Raise the right arm, bending the right elbow and touching the right hand to the back of the neck.

**Action:** Grab the right elbow with the left hand, and pull to the left. Hold this position for 10 to 15 seconds. Return to the starting position. Do the same stretch, and pull the left elbow with the right hand for 10 to 15 seconds.

## THIGH STRETCH

This stretches the quadriceps and anterior tibialis.



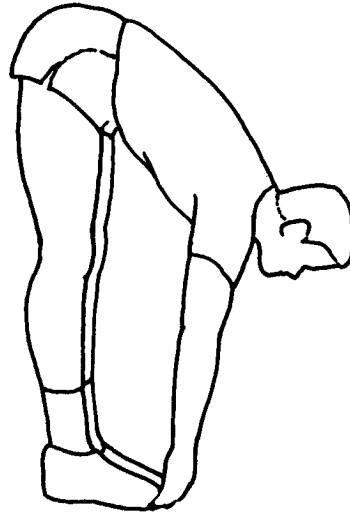
**Position:** Stand. (For variation, lie on the stomach.)

**Action:** Bend the left leg up toward the buttocks. Grasp the toes of the left foot with the right hand, and pull the heel to the left buttock. Extend the left arm to the side for balance. Hold this position for 10 to 15 seconds. Return to the starting position. Bend the right leg, grasp the toes of the right foot with the left hand, and pull the heel to the right buttock. Extend the right arm for balance. Hold this position for 10 to 15 seconds. Return to the starting position.



## HAMSTRING STRETCH (STANDING)

This stretches the hamstrings, erector spinae, and gluteal muscles.

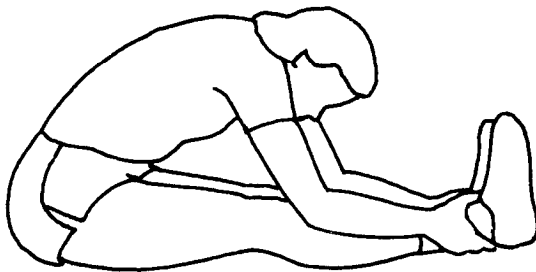


**Position:** Stand with the knees slightly bent.

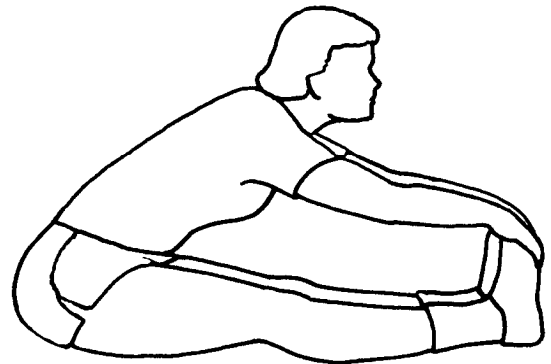
**Action:** Bend forward keeping the head up, and reach toward the toes. Straighten the legs, and hold this position for 10 to 15 seconds.

## HAMSTRING STRETCH (SEATED)

In addition to the muscles mentioned in the standing hamstring stretch, this stretches the calf (gastrocnemius and soleus) muscles.



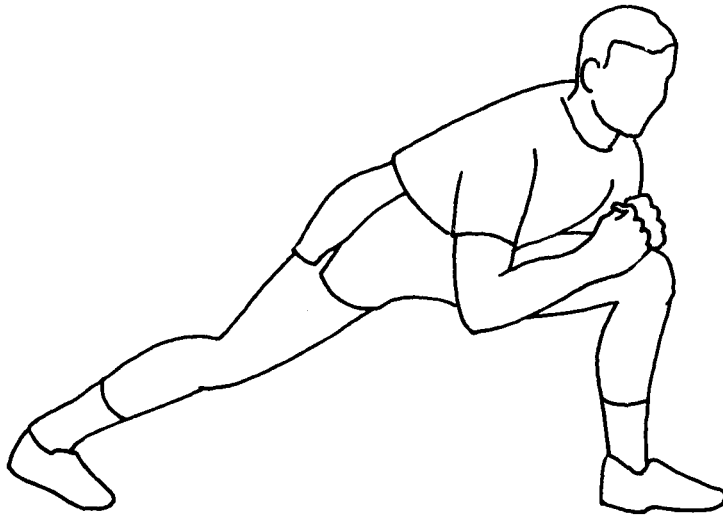
**Position:** Sit on the ground with both legs straight and extended forward with the feet upright about six inches apart. Put the hands on the ankles or toes.



**Action:** Bend from the hips, keeping the back and head in a comfortable, straight line. Hold this position for 10 to 15 seconds. (Variation for greater stretch: Stretch and pull back on the toes.)

## **GROIN STRETCH (STANDING)**

**This stretches the hip adductor muscles.**

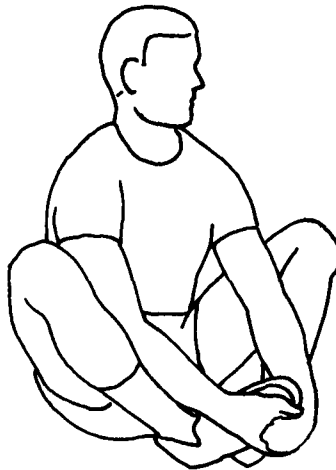


**Position:** Lunge slowly to the left while keeping the right leg straight, the right foot facing straight ahead and entirely on the floor.

**Action:** Lean over the left leg while stretching the right groin muscles. Hold this position for 10 to 15 seconds. Repeat with the opposite leg.

## **GROIN STRETCH (SEATED)**

**This stretches the hip adductor and erector spinae muscles.**

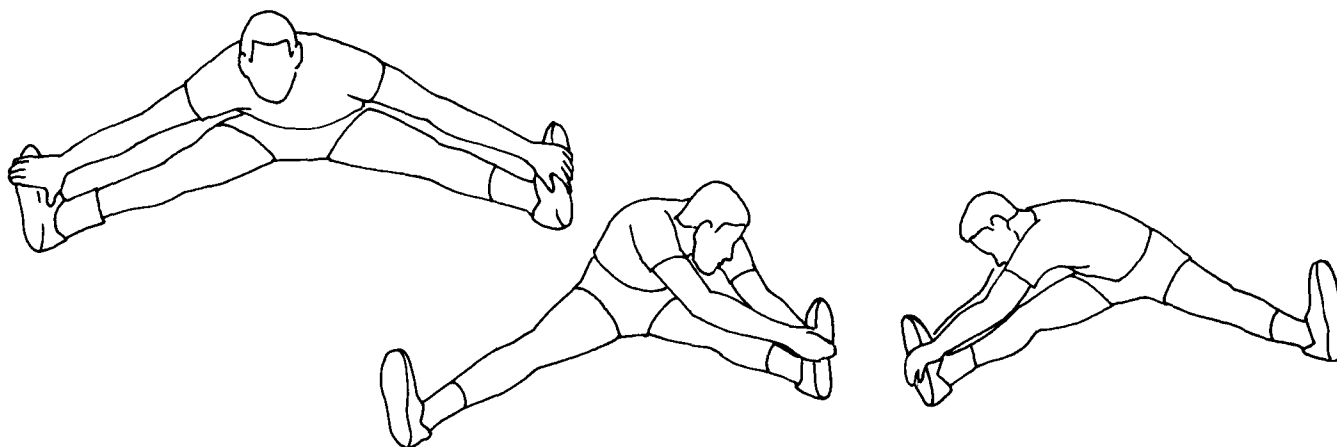


**Position:** Sit on the ground with the soles together. Place the hands on or near the feet.

**Action:** Bend forward from the hips, keeping the head up. Hold this position for 10 to 15 seconds.

## GROIN STRETCH (SEATED STRADDLE)

This stretches the hip adductor (on the inside of the upper leg), gluteals, erector spinae, and hamstring muscles.



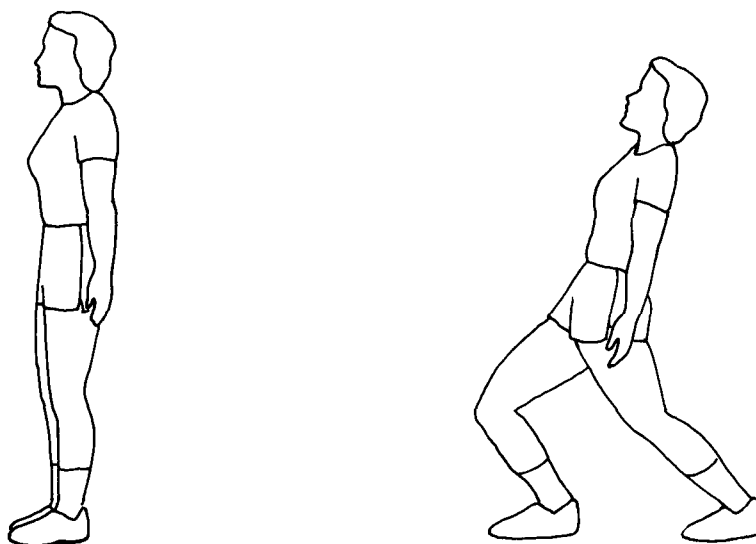
**Position:** Sit on the ground with the legs straight and spread as far apart as possible.

**Action:** Bend forward at the hips, keep the head up, and reach toward the feet. Hold this position for 10 to 15 seconds.

**Variation:** Stretch to one side while trying to touch the toes. Next, stretch to the other side.

## CALF STRETCH

This stretches the calf (gastrocnemius and soleus) muscles.

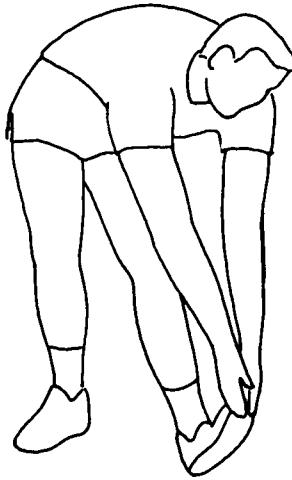


**Position:** Stand straight with the feet together, arms extended downward, elbows locked, palms facing backward, fingers extended and joined, and head and eyes facing front.

**Action:** Move the right foot to the rear about two feet, and place the ball of the foot on the ground. Slowly press the right heel to the ground. Slowly bend the left knee while pushing the hips forward and arching the back slightly. Hold this position for 10 to 15 seconds. Return to the starting position. Repeat with the left foot. Return to the starting position.

## **CALF STRETCH (VARIATION: TOE PULL)**

**This stretches the calf (gastrocnemius) and to a lesser extent the hamstrings, gluteus maximus, and erector spinae muscles.**

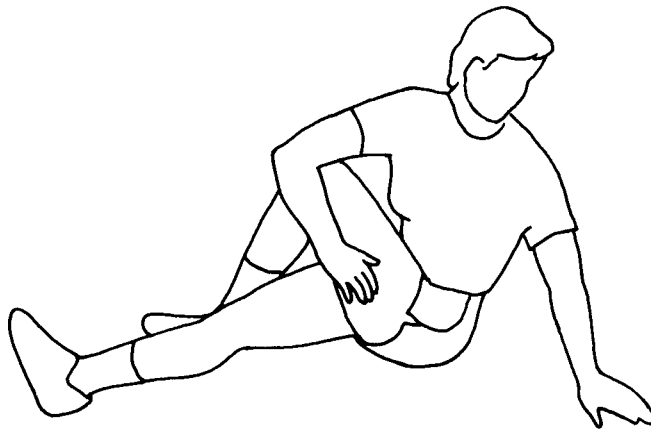


**Position:** Stand with the feet shoulder width apart and the left foot slightly forward.

**Action:** Bend forward at the waist. Slightly bend the right knee, and fully extend the left leg. Reach down and pull the toes of the left foot toward the left shin. Hold this position for 10 to 15 seconds. Return to the starting position. In a similar manner, pull the toes of the right foot toward the right shin, and hold for 10 to 15 seconds.

## **HIP AND BACK STRETCH (SEATED)**

**This stretches the hip abductors, erector spinae, latissimus dorsi, and oblique muscle groups.**

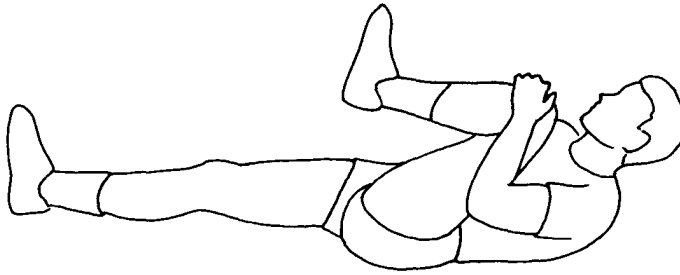


**Position:** Sit on the ground with the right leg forward and straight. Cross the left leg over the right while sitting erect. Keep the heels of both feet in contact with the ground.

**Action:** Slowly rotate the upper body to the left and look over the left shoulder. Reach across the left leg with the right arm, and push the left leg to your right. Use the left hand for support by placing it on the ground. Hold this position for 10 to 15 seconds. Repeat this stretch for the other side by crossing and turning in the opposite direction.

## HIP AND BACK STRETCH (LYING DOWN)

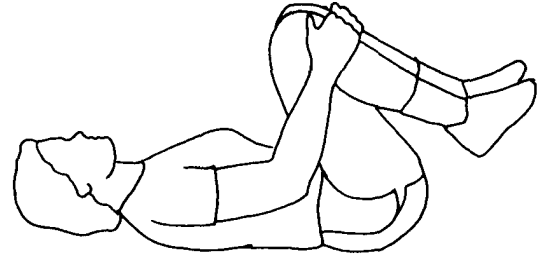
This stretches the gluteal and erector spinae muscles.



**Action 1**

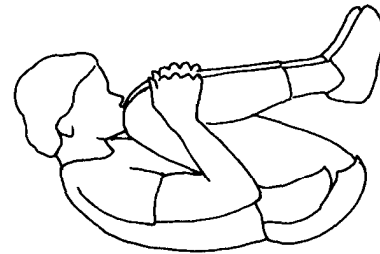
**Position:** Lie on the back with the arms straight beside the body. Keep the legs straight and the knees and feet together.

**Action 1:** Bring the left leg straight back toward the head, leaving the right leg in the starting position. Bring the head and arms up. Grab the bent left leg below the knee, and pull it gradually to the chest. Hold this position for 10 to 15 seconds. Gradually return to the starting position. Repeat these motions with the opposite leg.



**Action 2**

**Action 2:** Pull both knees to the chest. Pull the head up to the knees. Hold for 10 to 15 seconds. Return to the starting position.

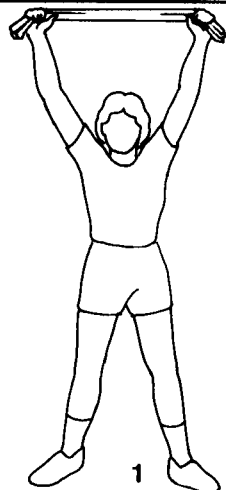


## PASSIVE STRETCHES

Passive stretching is done with the help of a partner or equipment. The examples in this chapter show passive stretching done with a towel or

with a partner. When stretching alone, using a towel may help the exerciser achieve a greater range of motion.

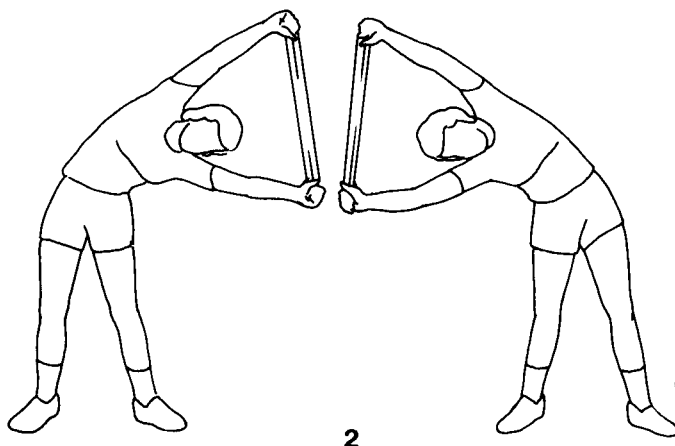
### TOWEL STRETCHES



This stretches the abdominal and pectoral muscles.

**Position:** Stand erect with the hands overhead and grasping a towel.

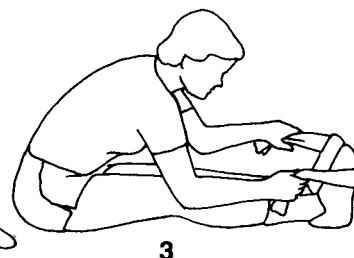
**Action:** Pull tightly on the towel while reaching up and slightly arching the back. Hold for 10 to 15 seconds.



This stretches the abdominals, obliques, and latissimus dorsi.

**Position:** Stand erect with the hands overhead and grasping a towel.

**Action:** Slowly bend sideways to the left as far as possible. Hold for 10 to 15 seconds. Repeat for the opposite side. While doing this stretch, pulling on the towel with the bottom arm will enhance the stretch.

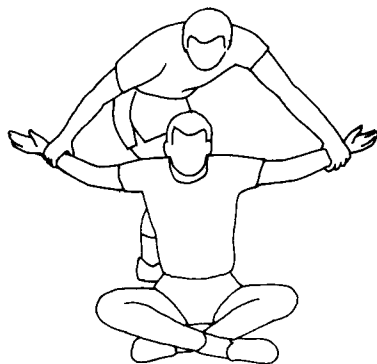


This stretches the hamstring, calf, and low back muscles.

**Position:** Sit with the legs straight and together. Grasping each end of a short towel, place the middle of the towel over the balls of the feet. **Action:** Pulling on the towel, come forward as far as possible keeping the legs straight and the toes pulled back.

### PARTNER-ASSISTED CHEST STRETCH

This exercise stretches the pectoralis major, deltoids, and biceps muscles.

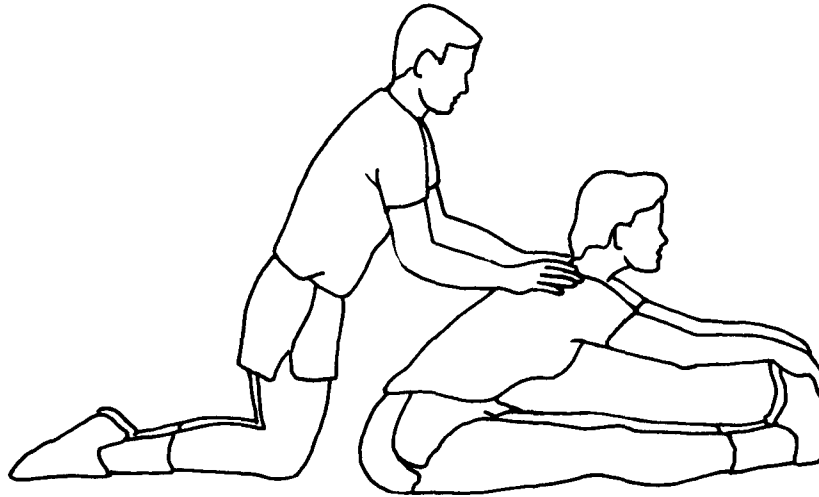


**Position:** Sit erect with the arms straight, elevated to shoulder height, and the palms facing forward. The partner stands behind the exerciser grasping the arms between the wrists and the elbows.

**Action:** The partner gradually pulls both of the exerciser's arms toward the rear until the stretch causes the exerciser mild discomfort. Hold this position for 10 to 15 seconds.

## PARTNER-ASSISTED HAMSTRING STRETCH

This exercise stretches the hamstrings and erector spinae muscle groups.

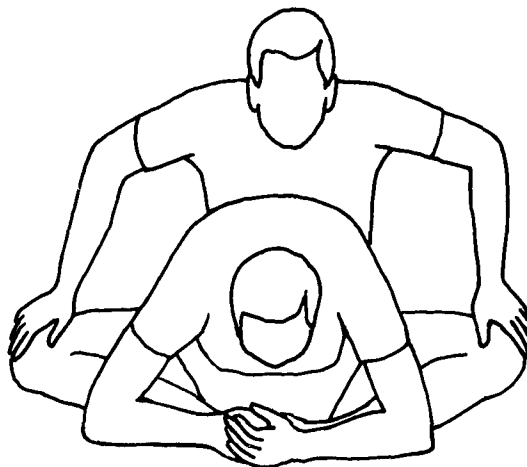


**Position:** Sit erect on the ground with the legs together. The partner kneels behind the exerciser. If the partner stands, he may apply too much pressure.

**Action:** The partner places light pressure on the exerciser's upper back until the exerciser's forward motion results in mild discomfort. This position is held for 10 to 15 seconds.

## PARTNER-ASSISTED GROIN STRETCH

This exercise stretches the hip adductor and erector spinae muscle groups.



**Position:** Sit on the ground with knees bent and soles together. The partner kneels behind the exerciser. If the partner stands, he may apply too much pressure.

**Action:** The partner places light pressure on the exerciser's knees with his hands and leans gently on the exerciser's back with his chest until the stretch causes the exerciser mild discomfort. This position is held for 10 to 15 seconds.

Soldiers can do PNF (Proprioceptive Neuromuscular Facilitation) stretches for most major muscle groups. PNF stretches use a series of contractions, done against a partner's resistance, and relaxations.

Obtaining a safe stretch beyond the muscle's normal length requires a partner's assistance. The following four steps provide general guidance as to how PNF stretches are done. Both the exerciser and partner should follow these instructions:

1. Assume the stretch position slowly with the partner's help.
2. Isometrically contract the muscles to be stretched. Hold the contraction

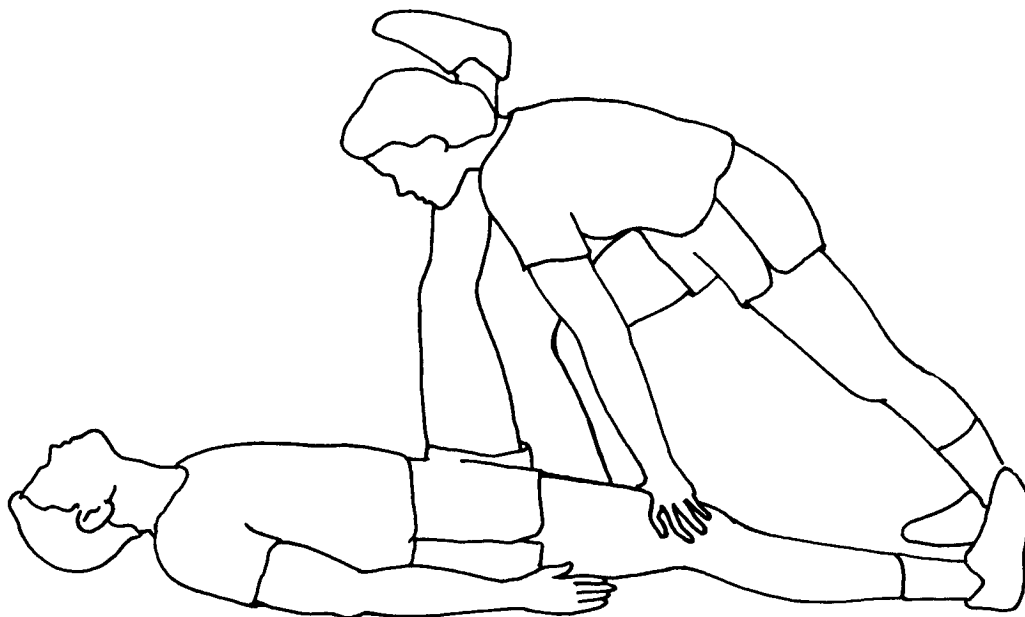
for 5 to 10 seconds against the partner's unyielding resistance.

3. Relax. Next, contract the antagonistic muscles for 5 to 10 seconds while the partner helps the exerciser obtain a greater stretch.

4. Repeat this sequence three times, and try to stretch a little further each time. (Caution: The exerciser should not hold his breath. He should breathe out during each contraction.)

Several examples of PNF stretches are provided below in a stepwise fashion. The numbers given above for each step correspond to the general description listed below.

## PNF HAMSTRING AND GLUTEAL STRETCH



1. The exerciser lies on his back and places the lower part of his left leg on the partner's right shoulder. The exerciser slowly stretches the hamstring and gluteal muscles by gradually bringing the straightened leg toward his head until he feels tension in the stretched muscles. The partner then applies light pressure on the exerciser's lower leg to help maintain or further the stretch.

2. The exerciser isometrically contracts his hamstring and gluteal muscles for 5 to 10 seconds by trying to move his leg downward

and away from his head. The partner steadily resists the exerciser's efforts and does not allow any movement to occur. 3. The exerciser relaxes the hamstring and gluteal muscles. He then tries to stretch them farther by using the partner's help and by contracting the antagonistic, hip flexor muscles (the iliopsoas and quadriceps) and the tibialis anterior muscle for 5 to 10 seconds.

4. Perform these movements three times for each leg. Try to stretch a little further each time.



## PNF CHEST STRETCH



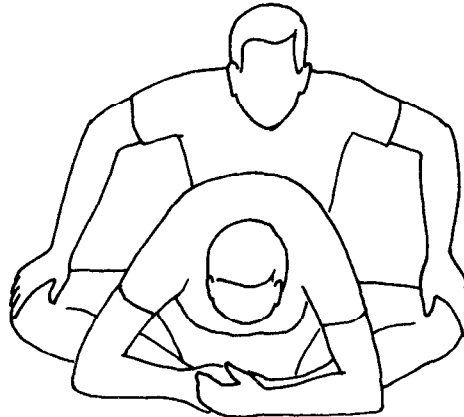
1. The exerciser and partner assume the positions used in the partner-assisted chest stretch. The exerciser slowly stretches until he feels tension in the stretched muscles. The partner then applies light pressure on the forearm to help maintain or further the stretch.

2. The exerciser contracts the pectorals for 5 to 10 seconds, trying to pull his arms and hands together against the partner's unyielding resistance.

3. The exerciser relaxes his pectorals and attempts to stretch further with the partner's help while contracting the antagonistic muscles of the upper back. He does this for 5 to 10 seconds.

4. Repeat this sequence three times, trying to stretch a little further each time.

## PNF GROIN STRETCH



1. The exerciser assumes the position used for the partner-assisted groin stretch. The partner kneels behind him. The exerciser slowly lowers his legs and leans forward until tension is felt in the muscles of the groin (his abductors) and lower back (erector spinae muscles). Next, the partner applies light pressure on the exerciser's thighs and back to help maintain or further increase the stretch.

2. The exerciser then attempts to push upward for 5 to 10 seconds by contracting the groin and lower back muscles while the partner resists and allows no movement to occur.

3. The exerciser relaxes the groin and lower back muscles and tries to stretch further with the partner's help and by contracting the antagonistic muscles (hip abductor and abdominal muscles) for 5 to 10 seconds.

4. Perform these movements three times. Try to stretch a little further each time.