

6

STRETCHING

When muscles are trained through conditioning exercises they can become tight. Stretching extends the muscles, helping them relax and maintain flexibility. It also relieves stress and contributes to mental as well as physical health. Stretching exercises should always be included in warm-up and cool-down routines for muscle conditioning or sports.

There are two basic kinds of stretches: static and dynamic. A static stretch is one in which a position or a posture is extended and held for a period of time. Yoga is an example of static stretch exercise. Most of the stretches included in this book are static exercise. Dynamic stretching involves range of motion, such as in calisthenics and aerobic dance. Some of the calisthenics in Chapter 5 involve dynamic stretching. People just beginning an exercise program should concentrate on static stretching, adding dynamic stretches as they develop flexibility.

Flexible joints and a limber body reduce the risk of injury in physical activities. The most effective and the safest way to develop flexibility is through slow, steady, and regular progress. Before beginning your program, work out a routine that is suited to your own level with your rehabilitation team or with experienced exercise therapists.

How to Stretch Correctly

The stretch should be held for approximately 10 to 30 seconds, and only to the point where mild tension is felt in the muscle. Relax as the stretch is held. Mild tension in the muscle should subside as the position is held. If it does not subside, ease tension on the muscle to a comfortable degree of tension where the stretch can be held. After the first stretch has been held, come back to the resting position completely before the next stretch.

The second stretch for the same muscle group is called the “developmental stretch” In this stretch, try to move a fraction of an inch further than the first stretch, creating a mild tension of the muscles while holding the stretch for the same number of seconds as the first one.

Prostheses may restrict the natural range of motion. For example, the person with a below-knee amputation will be restricted when flexing the knee, while someone with an above-knee amputation will be restricted when flexing the hip. Modified trim lines and flexible brim sockets are helpful in increasing flexibility.

STRETCHING EXERCISES		
Muscle	Exercise	Title
Shoulder/Upper Body	10	Overhead Stretch
Shoulder/Upper Body	11	Overhead Bent-Arm Stretch
Shoulder/Upper Body	12	Shoulder/Arm Stretch
Gastroc/Soleus	13	Standing Calf Stretch
Hamstrings	14	Standing Toe Touch
Hamstrings	15	Seated Toe Touch
Hamstrings	16	Hurdler's Stretch
Quadriceps	17	Anterior Thigh Stretch
Quadriceps	18	Standing Quadriceps Stretch
Quadriceps	19	Double Quadriceps Stretch
Gluteus Maximus/Hip	20	Seated Hip and Upper Hamstring Stretch
Inner Thigh/Groin	21	Standing Split
Lower Back/Abdomen	22	Prone Trunk Extension/ Low Back Arch

EXERCISE 10. OVERHEAD STRETCH

PURPOSE

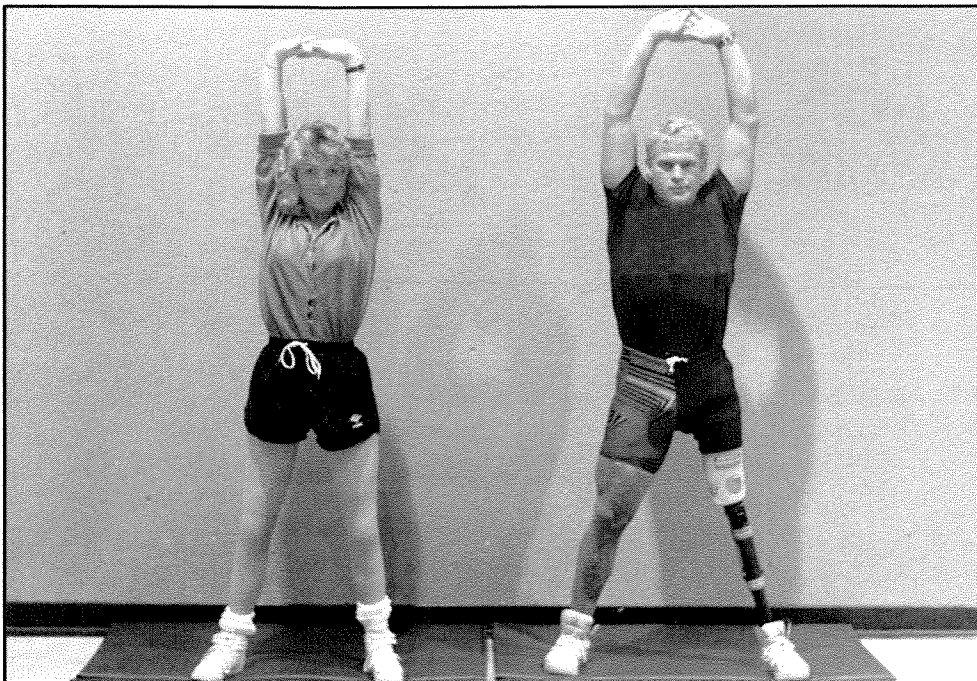
Stretch, warm-up, and cool-down for the muscles of the arms, shoulders, and upper body. This is also a relaxing deep breathing exercise.

PROCEDURE

- Stand with feet about shoulder-width apart.
- Raise both arms above the head and interlace fingers. Extend the elbows directly over the head and reach for the sky.
- Inhale and expand the chest while pulling in the stomach. Hold the position for a few seconds.
- Slowly exhale as the arms are brought down to the sides again.
- This exercise may be performed from a seated position.

MODIFICATIONS

The intensity of the stretch can be increased by raising the arms slightly behind the head rather than straight up from the head. However, raising the arms behind the head requires good standing balance.



Beginners should stand against a wall or other support surface until good standing balance is developed.

EXERCISE 11. OVERHEAD BENT-ARM STRETCH**PURPOSE**

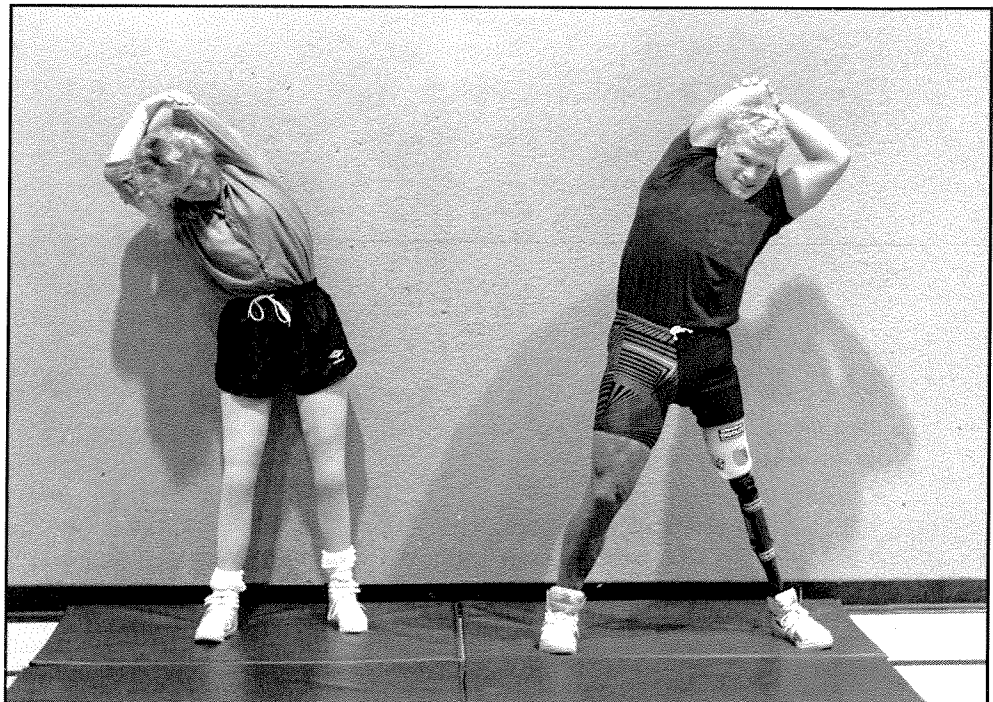
Stretches and exercises muscles on the side of the trunk, including the triceps, shoulder, latissimus dorsi, and the obliques.

PROCEDURE

- Stand with the feet about shoulder width apart or slightly wider. The knees may be slightly bent to assist in maintaining balance.
- Raise both arms above the head. Grab hold of the left elbow from behind with the right hand and pull the left arm as if to bring it over the head.
- Bend as far as possible from the waist on the right side as the left elbow is being pulled. Hold the position for 10 seconds and then slowly return to the upright position.
- Alternate hands and bend to the left side.

MODIFICATIONS

It is acceptable to lean against a wall for better standing balance. Also, this exercise may be done from a seated position.



Ellis and Mannino use a wall for support to maintain standing balance.

EXERCISE 12. SHOULDER/ARM STRETCH**PURPOSE**

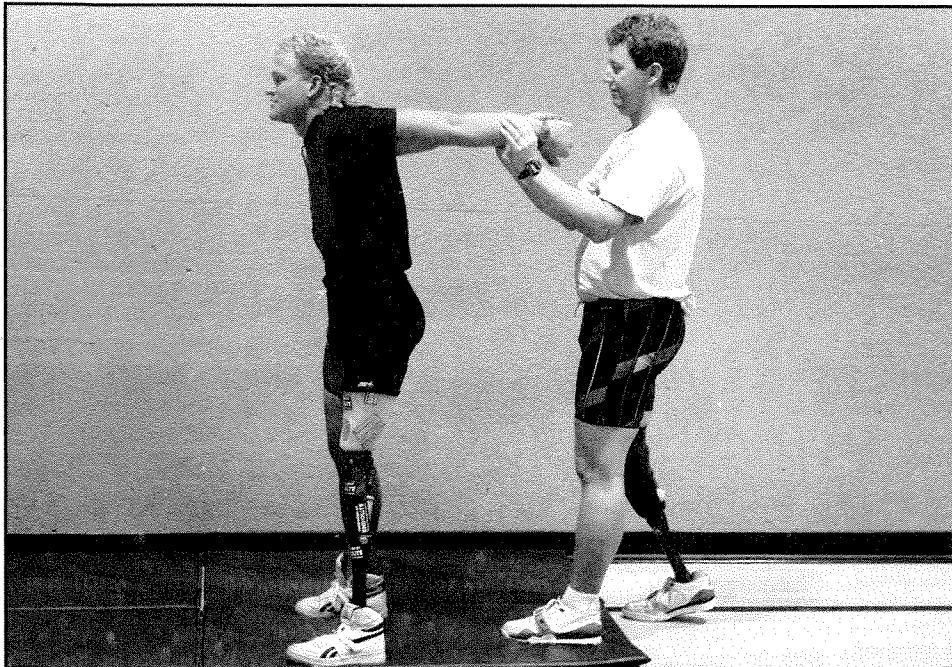
Warm-up and cool-down for the shoulders, arms, chest, and upper back muscles.

PROCEDURE

- Stand with feet comfortably apart and hands down at the sides.
- Raise both arms out from the body to shoulder height. With the arms parallel to the floor and at shoulder height, bring the fingers of both hands as close together as possible. Bring your hands together behind the back and keep the head up, the back straight, and do not bend at the knees.
- Bring both arms back out to the sides before repeating the exercise.
- This exercise may be done from a seated position.

VARIATION

When done without an assistant, this exercise requires great flexibility in order to make the hands meet behind the back. However, it is an effective stretch exercise even if the hands do not touch in the back.



With the assistance of Richard Hughes, Greg Mannino is able to make his hands meet behind his back.

EXERCISE 13. STANDING CALF STRETCH**PURPOSE**

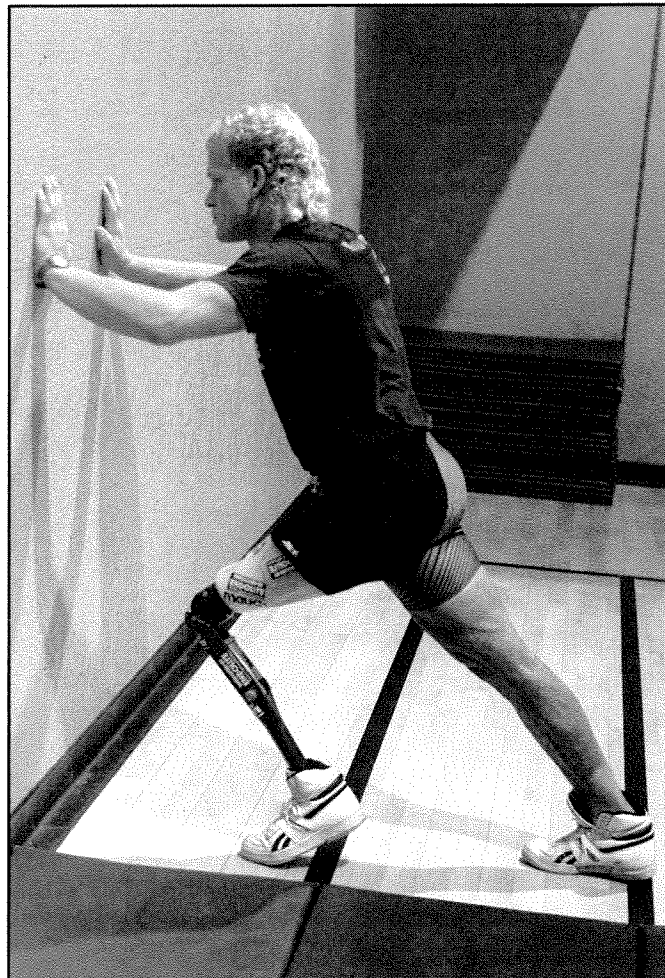
Stretches the gastrocnemius and soleus muscles.

PROCEDURE

- Stand about 3 feet away from the wall. Step forward with one foot but keep the knee of the back leg straight.
- Lean forward as far as is comfortable, trying to touch the chest to the wall. Keep the heel of the back foot on the floor. Hold the position for about 15 seconds.
- As flexibility is developed, step further away from the wall to increase the stretch.

VARIATION

To stretch the lower calf and Achilles tendon, bend the knee of the back leg during the lean forward. Be certain to keep the heel of the back leg on the floor.



Greg Mannino uses a wall for support while doing this stretch. An exercise bar may also be used.

EXERCISE 14. STANDING TOE TOUCH**PURPOSE**

Improve balance and develop flexibility in the hamstring muscles.

MODIFICATIONS

If needed, use a wall for support and balance. The anterior trim lines of the AK socket may restrict range of motion. They can be lowered or a flexible brim socket can be used.

PROCEDURE

This exercise may be done with the knees slightly bent or with the legs held straight for greater stretch of the hamstring muscles. Three variations are shown.

VARIATION 1

- As shown below, bend from the waist as if to touch one toe. It may not be possible without practice, but reach as far as is comfortable.
- Hold the position for a few seconds and round the back to help relax the muscles of the lower back if necessary.
- Return to an upright position before alternating sides.



Samantha Ellis uses a wall to help maintain balance.

CAUTION

The stretch should be performed in a smooth manner. Do not bounce.



Greg Mannino demonstrates good flexibility.

VARIATION 3

- Cross one leg over the other and try to touch the toes or the floor. When doing toe touches this way, use the first stretch to go as far as you are comfortable, then hold for 10-20 seconds.
- During the next stretch, go a little further. Hold for 10-20 seconds.

VARIATION 2

- Bend straight forward from the waist.
- Try to touch the tips of the toes or the floor with the fingers or the palms of both hands. This may not be possible without practice. Hold the position for 10-20 seconds, rounding the back to relax the lower back muscles.
- Return to an upright position before alternating sides.

The cross-legged position of Variation 3 adds extra stretch on the hamstring muscles of the rear leg.



EXERCISE 15. SEATED TOE TOUCH

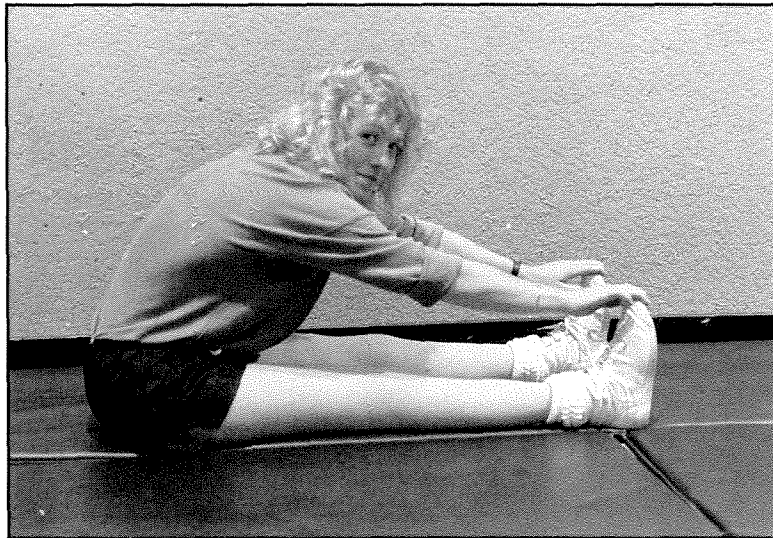
For some with a lower limb amputation (especially above-knee), seated toe touches may be easier to perform than standing toe touches because they do not require maintaining balance.

PURPOSE

Stretches the hamstring muscles.

PROCEDURE**VARIATION 1**

- Sit with back and legs straight and legs close together.
- Bend from the waist and try to touch both toes with the fingers of both hands. Hold the position for a few seconds, allowing the back muscles to relax.
- Slowly return to the starting position and repeat as desired. Keep the head up; this will help keep your back straight.



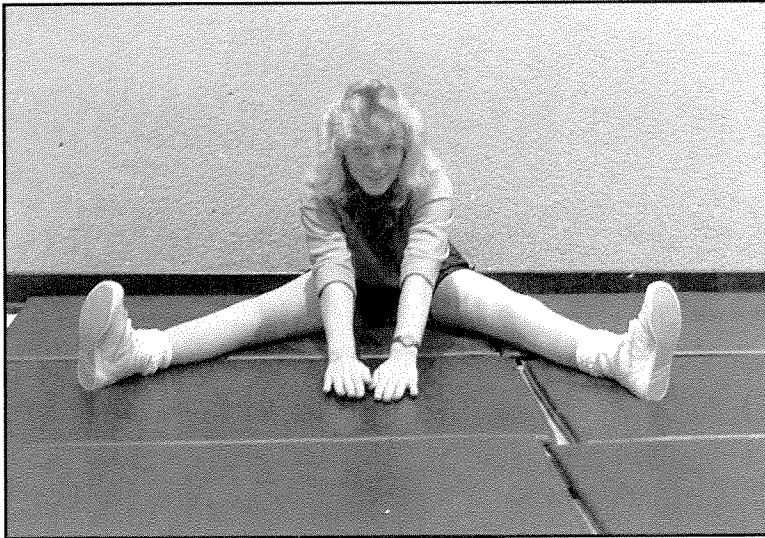
Samantha Ellis touches her toes with legs together.

MODIFICATIONS

- The stretches can be combined and done in a forward-side-side manner as seen in Variations 2 and 3.
- A partner can assist you in going further forward by pushing slowly from behind or pulling gently on your arms from the front.
- You can also stretch further forward by bracing your feet against a stationary object and pulling yourself forward with a rope or grabbing a fixed object.

VARIATION 2

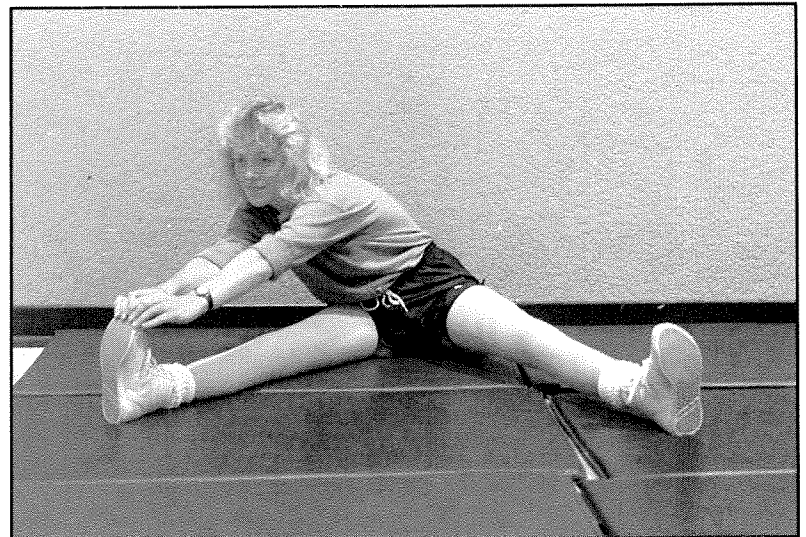
- Spread legs apart as far as is comfortable.
- Reach with both arms straight out from the body as far as possible. Hold the position for 10-30 seconds, allowing the back muscles to relax.
- Slowly return to the starting position before repeating the exercise.



Ellis stretches arms forward with legs apart.

VARIATION 3

- Keep the legs as far apart as possible.
- Reach to touch the toes of one foot with both hands. The opposite hip may pull up from the floor slightly. Hold the position for a few seconds and allow the back muscles to relax.
- Slowly return to the starting position and repeat the exercise on the other leg.
- For more stretch and greater range of motion, try to touch your forehead to your knee.



Ellis demonstrates the basic stretch.

EXERCISE 16. HURDLER'S STRETCH

PURPOSE

Stretches the hamstring muscles.

PROCEDURE

- Sit on the floor with legs spread apart. Keep one leg straight and flex the other one at the knee. (The flexed position may be difficult at first.)
- Lean forward to touch the toes on the outstretched leg. Keep the head up and back straight, bending only at the waist.
- Do not bounce, but stretch gradually, holding the furthest position for at least 20 seconds.
- Stretch a little further on each repetition.
- Avoid stressing the medial ligaments of the bent leg by proper positioning.

MODIFICATIONS**AK flexible brim**

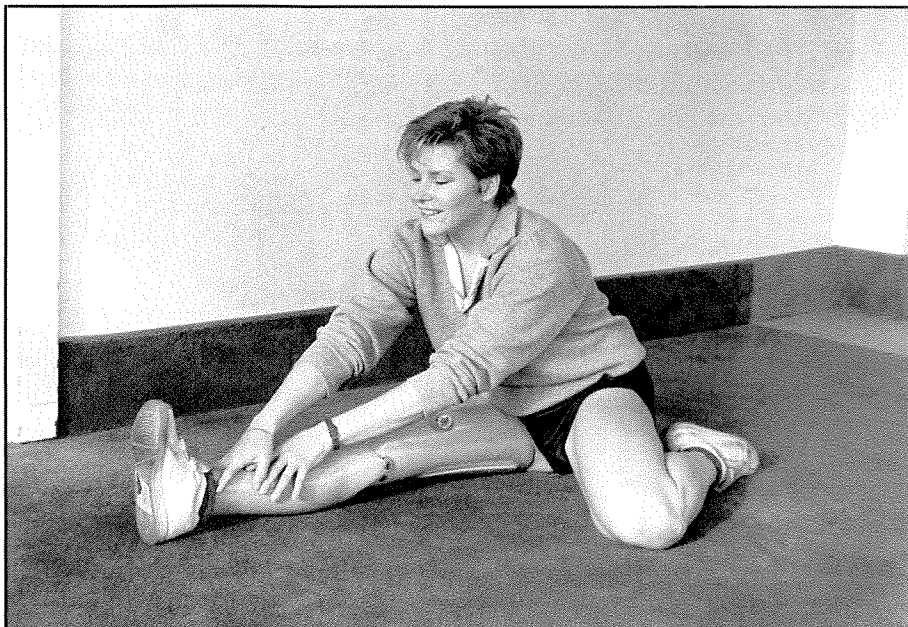
A person with an above-knee amputation may benefit from a flexible brim socket in stretching on the prosthetic side with the leg extended. If flexing the AK prosthesis at the knee is too difficult, do only the Seated Toe Touches to stretch the hamstrings with the prosthesis straight (Exercise 15).

BK suspension sleeve

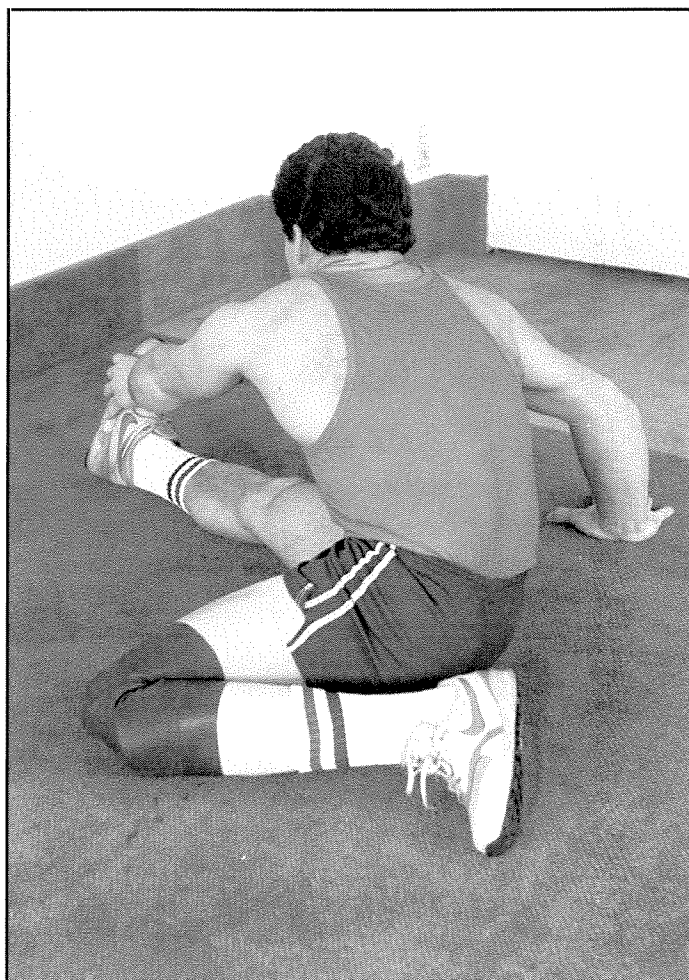
When the BK prosthetic side is extended, a cuff strap suspension may prevent a full stretch by holding the knee in flexion. Using a suspension sleeve will allow the knee to achieve a full range of motion. When flexing the BK prosthesis, the ActivSleeve suspension sleeve worn by Albert Rappoport allows the residual limb to pull out of the socket, relieving any hamstring impingement.

Lowered BK trim line

The degree of flexibility on the BK prosthetic side will depend on the height of the trim lines. While lowered medial and lateral trim lines are very helpful, lowering the posterior trim lines will best improve knee flexion.



Linda Pedersen demonstrates the Hurdler's Stretch to stretch the hamstrings of her residual limb.



Albert Rappoport stretches the hamstrings of his sound leg.

EXERCISE 17. ANTERIOR THIGH STRETCH**PURPOSE**

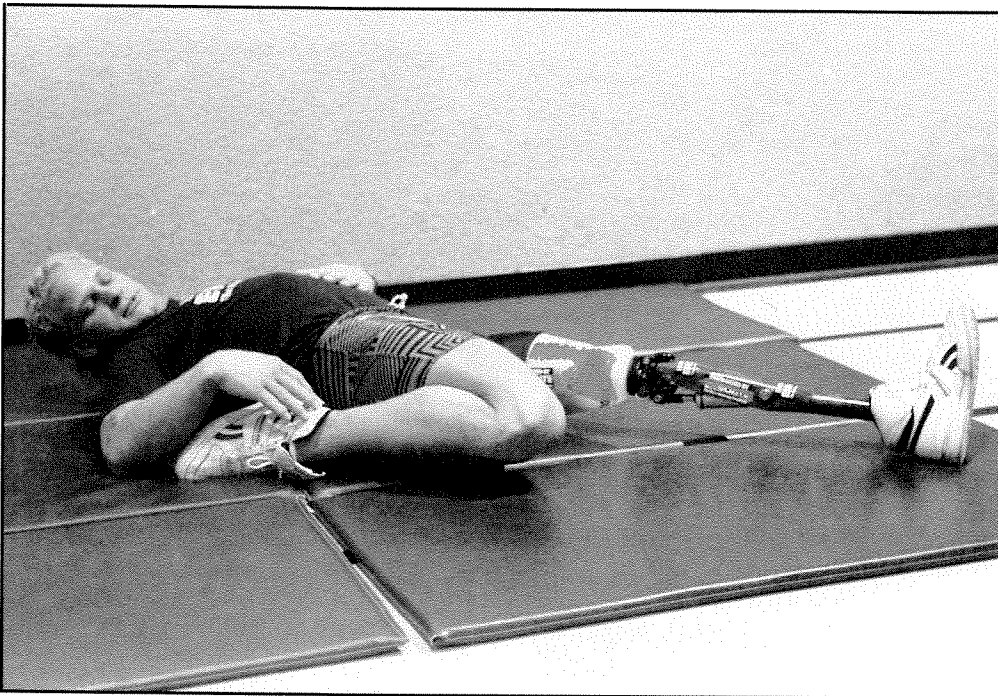
Stretches the quadriceps and nearby iliopsoas muscles.

PROCEDURE

- Lie face-up on the floor. Flex one knee while keeping the other leg straight out on the floor.
- The flexed knee will be up from the floor and the back somewhat arched. The foot may be held, as shown by Greg Mannino.
- Try to get the knee down to the floor and the back flat. Go only as far as comfortable. Hold for about 15 to 20 seconds.
- Relax before alternating sides.
- Stretching the residual limb with a flexed knee is possible for those with a BK amputation but not with an AK amputation. (Exercise 16 discusses alternatives for hamstrings.)

CAUTION

Do not stretch the quadriceps like this if you have knee problems. As an alternative, use the Standing Quadriceps Stretch (Exercise 18).



Greg Mannino stretches the hamstring muscles in getting his knee to touch the floor while holding his foot in place.

EXERCISE 18. STANDING QUADRICEPS STRETCH**PURPOSE**

Stretches the quadriceps muscle.

PROCEDURE

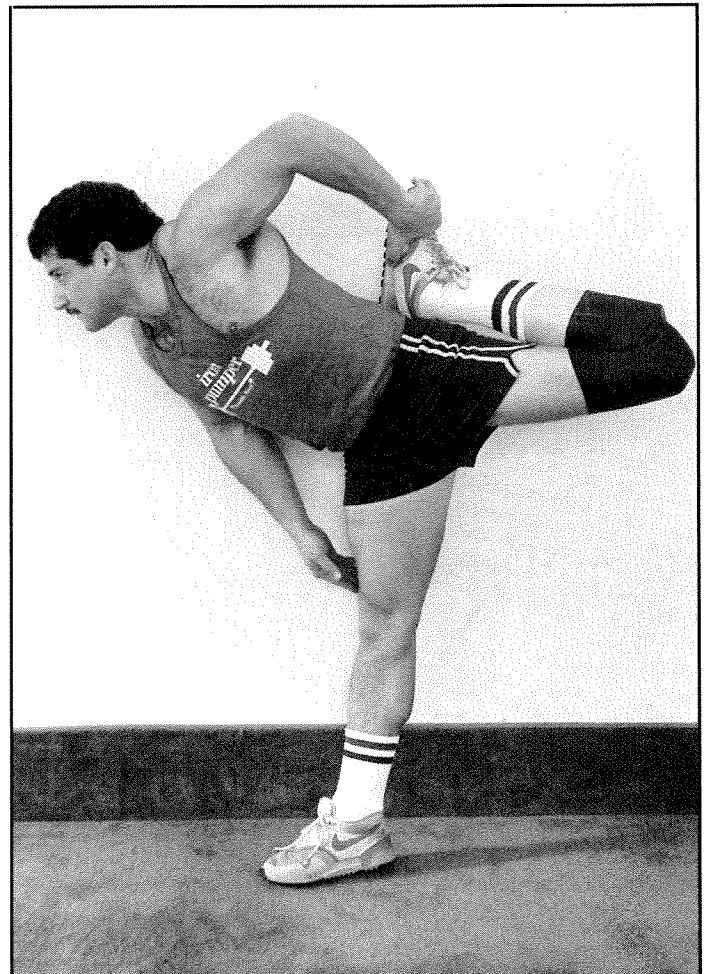
- Using an exercise bar or a wall for support, bend one leg back and up.
- Grab the ankle of the leg and pull it tight against the buttocks, keeping the back straight.
- Hold for about 15 to 20 seconds and release the leg to a standing position.
- Alternate sides and repeat.

VARIATION

To stretch the prosthetic side, bend as demonstrated by Albert Rappoport and pull the upper thigh until parallel to the floor. If you can keep your back in an upright position, it is preferable as you advance. The ActivSleeve suspension sleeve allows for full flexibility. The residual limb can actually pull out of the socket and slip right back into the prosthesis after the stretch because this sleeve stays in place on the thigh.

CAUTION

Recommended only for BK-level exercisers. AK-level exercisers should use the Anterior Thigh Stretch for the sound limb only (Exercise 17).



Albert Rappoport demonstrates excellent balance and form.

EXERCISE 19. DOUBLE QUADRICEPS STRETCH**PURPOSE**

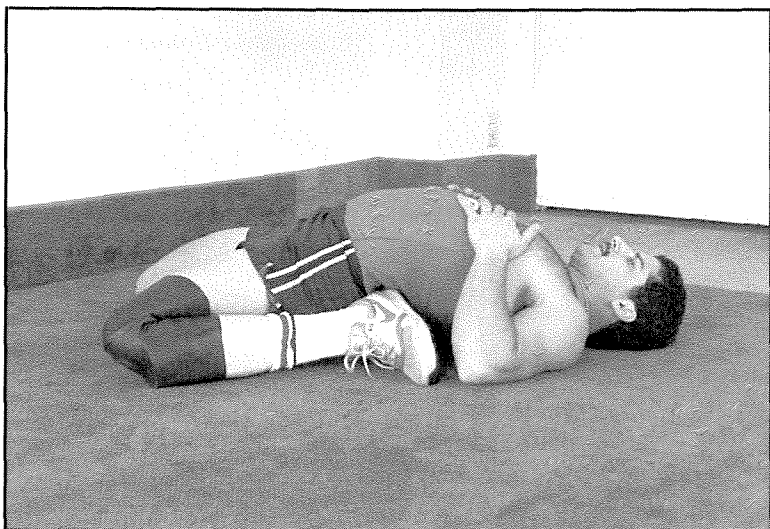
Stretches the quadriceps muscles.

PROCEDURE

- Kneel down on both knees and sit down on your legs.
- Move your legs outside the width of the hips and turn the prosthetic foot outward while keeping the toes of the sound foot straight back.
- Slowly lean backward, moving your hands on the floor for support and to control the movement.
- Allow the residual limb to slide out of the socket as necessary.
- Lean back as far as is comfortable. Hold for 20 seconds and then return to the kneeling position. Try to lower the body a bit farther back each time.
- The goal is to lean back until the shoulders are on the floor, as shown in the photo, but do not overstretch at first.

MODIFICATIONS

- To relieve stress on the knees when in the supine position of the exercise, move them closer to the midline of the body. The sound side foot should be pointed straight back. The prosthetic foot cannot bend straight back but can be positioned to the side as pictured.
- The ActivSleeve suspension sleeve allows the knee to pull out of the prosthesis and then go back into the socket without special adjustment.
- The posterior trim line may be normal height, equal to the patellar bar, but can be modified to a lower position on those with longer residual limbs without causing any problems while walking. Medial/lateral trim lines are lowered.



Albert Rappoport demonstrates this difficult and advanced stretch.

CAUTION

This is a very demanding stretch exercise and recommended only for those with well-developed flexibility. For best results, BK-level exercisers should use the ActivSleeve suspension sleeve. This stretch is not recommended for persons with chronic knee problems or back problems.

EXERCISE 20. SEATED HIP AND UPPER HAMSTRING STRETCH

PURPOSE

Stretches the gluteus maximus and other hip muscles and hamstrings.

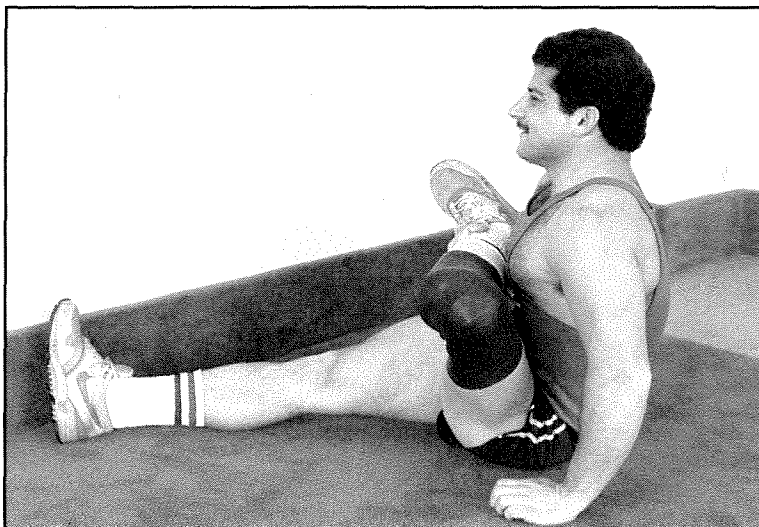
PROCEDURE

- Sit on the floor with your back against a wall.
- Keeping one leg straight out in front, flex the other knee and gently pull the entire leg toward the chest until tension is felt at the back of the upper leg. Be sure the leg is pulled to the chest as one unit, from the ankle and knee, so that undue stress is not placed on the knee.
- Hold the stretch for 20 seconds before slowly putting the leg flat on the floor again. Try to pull the leg up a bit further with each repetition.

CAUTION

Socket impingement and suspension may restrict completion of this exercise for the AK prosthetic side.

Greg Mannino demonstrates this exercise by balancing against the wall for support and using two hands to make the stretch complete. He holds his leg on the outside of the ankle with the one hand while the other hand supports the bent knee.



Albert Rappoport demonstrates a variation of this exercise. He balances his body with one arm while lifting his prosthetic leg for the stretch. This position may be used for both legs. The above stretch using two hands is preferable, but if there is no wall or back support available, try this technique.

EXERCISE 21. STANDING SPLIT**PURPOSE**

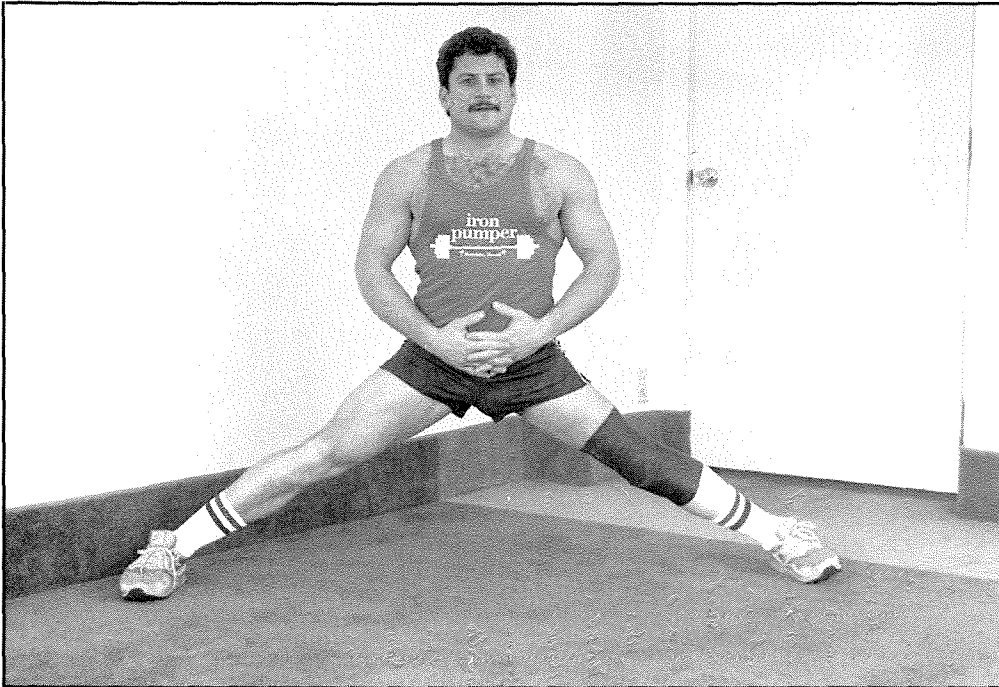
Stretches the inner thigh and groin.

PROCEDURE

- Stand with your legs slightly apart on a non-slip surface or lie flat in the supine position.
- Work your legs apart as far as you are able, moving them out one at a time in line with your hips. Keep the back and legs straight, if possible.
- Hold the stretch for 20-30 seconds and slowly return to the starting position.
- Hands may be positioned on the knees to gain stability and push legs outward.

VARIATION

Beginners may need to bend forward and balance themselves by holding on to a railing or other fixed object.



Albert Rappoport demonstrates the exercise wearing an exoskeletal prosthesis, ActivSleeve suspension sleeve, and a DAS Foot, which has excellent inversion/eversion capabilities so it can remain flat on the floor.

EXERCISE 22. PRONE TRUNK EXTENSION/LOW BACK ARCH**PURPOSE**

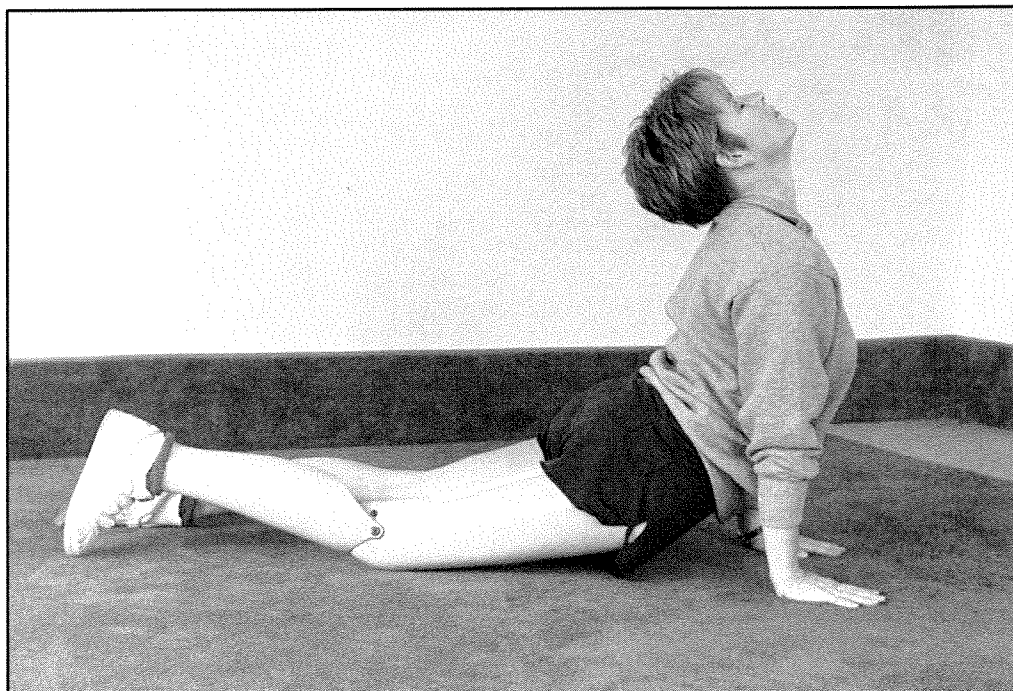
Stretches and strengthens primarily the muscles of the lower and mid-back, as well as the abdomen, chest, shoulders, and arms. Also stretches the hip flexors and abdominals.

PROCEDURE

- Lie face-down on the floor in a prone position with hands on the floor and elbows flexed at the chest level.
- Push up until the elbows are straight, as shown by Linda Pedersen.
- Keep the head up, legs on the ground, and arch the back to a comfortable position. Hold for 10-20 seconds and rest.
- Resume the stretch and try to arch the back slightly further than the last time. Hold for 30 seconds.

CAUTION

Do not arch your back so far that it is uncomfortable. This may cause back injury. When done correctly, this exercise can help to prevent back aches and pain because it strengthens the lower back muscles.



For the AK prosthesis wearer, the knee unit should be in the unlocked position while performing this exercise, as shown.