# 10

# **ABDOMINALS**

The abdominal muscles—rectus abdominus and the internal and external obliques—are part of the group that form the trunk musculature. Weak abdominal muscles are a cause of bad posture and may be a predisposing factor in chronic lower back pain. Strengthening these muscles will firm the waistline, improve posture, and result in a trimmer appearance. However, abdominal exercises do not spot-reduce fat from around the abdomen and waist. Fat is lost only by expending more calories than are consumed.

The sit-up is one of the most common exercises for abdominal strengthening and toning. The Bent-Leg Sit-up is popular because it does not cause excessive stress on the lower back. Straight-Leg Sit-ups are not recommended and should be avoided because they may cause undue strain on the lower back. (Straight-Leg Sit-ups work the hip flexor muscle as opposed to the abdominals.)

Many authorities agree that (depending on the type of exercise) abdominal muscles, unlike most other muscle groups, can be worked on a daily basis. Weight-resistive abdominal exercises should usually be alternated with a day of rest. Rate of progress is an individual judgment, but in the beginning it is best to proceed slowly.

Abdominal exercises may be used for fully defined muscular development or as a warm-up routine for other exercises and sports. In a muscular development routine, abdominal muscles are strengthened by:

- 1. increasing the number of repetitions per set
- 2. increasing the number of sets
- 3. progressively shortening the rest periods between sets
- 4. increasing the angle of the exercise
- 5. strapping on leg weights for some exercises or holding a weight plate while performing other exercises.

Abdominal exercises are usually performed with higher repetitions per set than are most weight-training exercises.

INCREASING THE NUMBER OF REPETITIONS Always do warm-up exercises before lifting weights.

Start with a minimum of 8 repetitions with a given weight. If a minimum of 8 repetitions cannot be completed, the weight is too heavy for you and the resistance should be lowered until 8 repetitions can be completed.

When 12 repetitions can be successfully completed, the weight should be increased by 5-10 pounds. When 12 repetitions can be completed with the increase in pounds, the weight may be increased again.

Work up to 15-20 repetitions per set for muscle maintenance, endurance, and tone.

When performing exercises with free weights, it is recommended that 2-6 sets for each particular muscle group be used.

#### **CAUTION**

Beginners are encouraged to use free weights with a spotter present. Certain exercises will require a spotter regardless of skill level (e.g., squats).

ABDOMINAL EXERCISE ROUTINE		
Muscle	Exercise	Title
Warm-up/Abdominals/Hip Flexors	53	Supine Leg Raise
Abdominals/Hip Flexors	54	Jackknife Sit-up
Abdominals/Hip Flexors	55	Bent-Leg Sit-up
Upper Abdominals/Hip Flexors	56	Bent-Knee Crunch
Abdominals/Hip Flexors	57	Incline Bench Sit-up with Variations
Abdominals/Hip Flexors	58	Nautilus Abdominal Chair
Lower Abdominals	59	Vertical Bench Bent-Knee Raise
Lower Abdominals/Hip Flexors	60	Vertical Bench Straight-Leg Raise
Lower Abdominals/Hip Flexors	61	Incline Leg Raise
Internal/External Obliques	62	Side Bends with Dumbbell
Internal/External Obliques	63	Side Bends/Hyperextension Bench
Upper Abdominals/Hip Flexors	64	Straight-Leg Sit-up/Hyperextension Bench
Abdominals/Shoulder Extensors	65	Exercise Wheel

## **EXERCISE 53. SUPINE LEG RAISE**

# **PURPOSE**

Warm-up and strength conditioning of the lower abdominal muscles and hip flexors.

# **PROCEDURE**

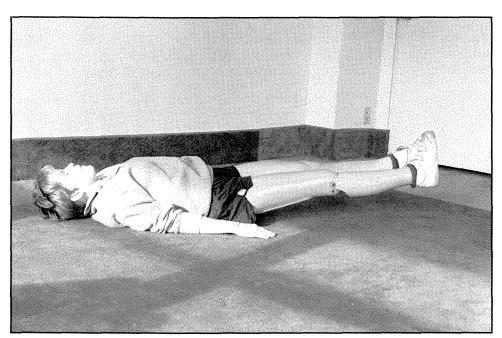
- Lie flat on your back with arms at sides and legs close together and straight out.
- Keep the heels close together while raising the legs 3 to 6 inches off the floor.
- Tighten abdominal muscles and tilt pelvis to flatten the lower back against the floor. This will stabilize the pelvis and protect the back. Hold the legs in this position for a few seconds. Increase the time gradually, week by week.
- For beginners, three sets are suggested with a 30-second to 1-minute rest period between each set.

# **MODIFICATIONS**

The prosthetic knee is locked in the straight position to prevent it from flexing. A person with AK amputation who does not have a locking knee unit can support the prosthesis and prevent it from flexing by placing the sound limb underneath the prosthesis or by pressing the heels together.

#### SKILL LEVEL

Beginner.



Linda Pedersen exercises with her above-knee quad socket, Mauch SNS Knee Unit, and Otto Bock SACH Foot.

# CAUTION This exercise can be stressful to the lower back. Omit if low back problems are present.

# EXERCISE 54. JACKKNIFE SIT-UP (ALSO KNOWN AS V-UP SIT-UP)

# **PURPOSE**

Strengthens the upper and lower abdominal muscles and hip flexors.

# **PROCEDURE**

- Lie on the floor in a supine position with legs straight out in front and arms extended behind the head.
- Keep the elbows and knees straight throughout the exercise.
- Simultaneously bring legs and arms together in a position as close to a vertical position as possible while bending from the waist.
- Lower the limbs to the supine position to complete each repetition.
- Do not rest while in the supine position.
- Inhale as you lower the legs and arms to a supine position and exhale as you come up to a vertical position.

# **MODIFICATIONS**

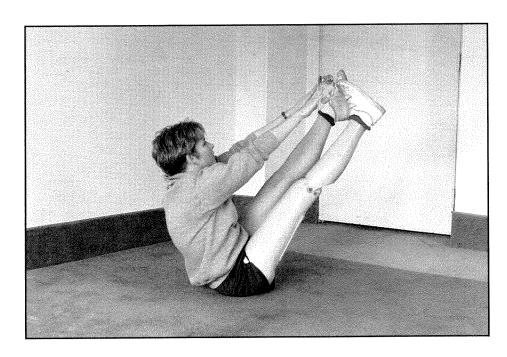
The prosthetic knee should be locked in extension to prevent it from flexing. A flexible brim above-knee socket may help in flexing the hip further while reaching the vertical position.

# SKILL LEVEL

Advanced.

# CAUTION

Ms. Pedersen keeps her back very straight as she reaches the top position because she has been conditioning for many years. Beginners and those with chronic back pain should not attempt to reach as high, but only try to reach the mid-calf, shins, or ankles. Start with the Bent-Knee Crunch (Exercise 56) or the Nautilus Abdominal Chair (Exercise 58) until you are ready to do the Jackknife Sit-ups. As strength of the abdominal muscles is developed, there will be less risk of possible back injury in daily activities and other exercise routines.



#### **EXERCISE 55. BENT-LEG SIT-UP**

#### **PURPOSE**

Strengthens the abdominal muscles and hip flexors.

# **PROCEDURE**

- Lie flat on your back with hands clasped behind your head.
- Bend the knees to about a 45-degree angle and have someone hold your feet to the floor
- Bend at the waist and bring your elbows up to your knees.
- Lower your body slowly and let your shoulders touch the mat.
- Exhale as you bring your body up and inhale as you lower it down.
- Repeat the exercise without pausing in order to keep tension on the abdominal muscles.

# **MODIFICATIONS**

For the person with AK amputation, the suspension of the sockets must be good and trimlines low enough to allow adequate hip flexion. To work the oblique muscles, twist your trunk as you raise it. Do not come up all the way if you are not able to complete at least 15 repetitions. If you are a beginner, start by only raising your head to complete a sit-up. If you can do that, raise your shoulders off the mat on the next set. Later, proceed to a half sit-up and then to a full sit-up as your strength increases.

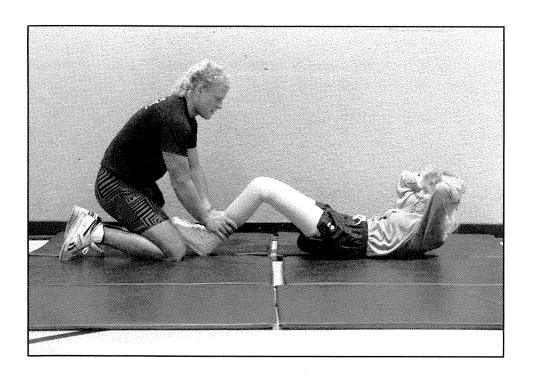
#### SKILL LEVEL

Intermediate.

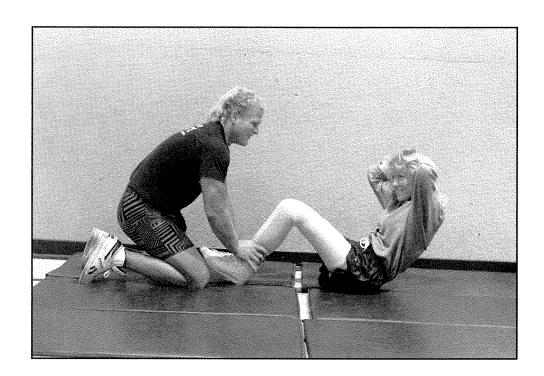
# NOTE

The person with a unilateral amputation will experience greater tension on the sound limb as both legs are held down.

Bent-Leg Sit-ups are easier on the back than are Straight-Leg Sit-ups. They also allow for better isolation of the abdominal muscles because they do not require as much use of the hip flexor muscles. Many beginning exercisers use this type of sit-up at first, since climbing onto and balancing on an incline bench is difficult for some people. However, the advantage of the Incline Bench Sit-up (Exercise 57) is that no partner is needed.



Samantha Ellis is assisted by Greg Mannino.



# **EXERCISE 56. BENT-KNEE CRUNCH**

# **PURPOSE**

Strengthens the upper abdominals and hip flexors.

# **PROCEDURE**

- Lie on a padded surface and place your legs on a bench so that your thighs are at a 45-degree angle.
- Clasp your hands behind your head and pull your head and upper body from the floor using only the abdominal muscles.
- Lead with the elbows as shown in the photos. Beginners should start with a partial sit-up, lifting just the head and shoulders off the mat (see photo).
- As strength and endurance are developed, increase to a 45-degree sit-up. This exercise is very effective when 15-25 sit-ups can be completed in succession with no pauses in between repetitions.

# **VARIATION**

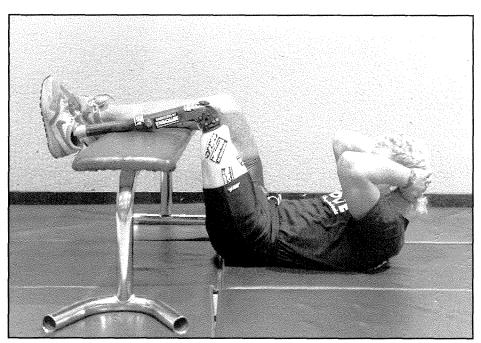
To work the intercostal muscles as well, twist to left and right sides alternately as you raise your torso to your legs. The routine for working the intercostals will be: center, right; center, left; center, right, etc.

# SKILL LEVEL

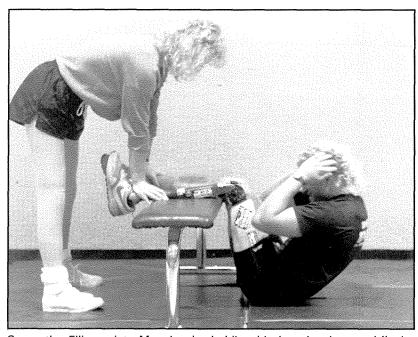
Advanced.

# CAUTION

If you begin to feel back strain, raise only the shoulders and head, and only as high as is comfortable.



Greg Mannino does a half sit-up, demonstrating the appropriate position for a person who has a back problem or is a beginner. (Notice that the low back remains in contact with the floor.)



Samantha Ellis assists Mannino by holding his legs in place while he does a full sit-up.

# **EXERCISE 57. INCLINE BENCH SIT-UP WITH VARIATIONS**

#### **PURPOSE**

Develops and strengthens the upper abdominal muscles and hip flexors.

#### **PROCEDURE**

- Adjust the sit-up board to the desired height.
- Sit on the incline board and place your feet underneath the foot bar. Flex your knees to about a 45-degree angle.
- Place your hands behind your head or across your chest (whichever is most comfortable) and tuck in your chin. (Hands behind the head is the most difficult position.)
- Arms may be held in a variety of positions but must remain fixed during the exercise to keep from swaying and to minimize excessive body movement. Concentrate on pulling up your body using only the abdominal muscles.
- Lie back flat on the bench to begin the sit-up.
- Bend at the waist and bring yourself to an upright position (45 degrees) until your elbows are at about the same height as your knees. Slowly return to the starting position.
- Repeat the exercise without pauses in order to maintain tension on the abdominal muscles. To keep tension on the abdominal muscles, do not come up too high or rest your back on the bench on the way down.

# **VARIATIONS**

For increased resistance, hold the weights behind your head or on your chest while doing sit-ups. To also work the oblique muscles, twist the upper body to each side, alternating each turn (i.e., center, left; center, right; center, left; etc.).

# **MODIFICATIONS**

The prosthesis should have good socket suspension; the AK prosthesis should have a flexible brim socket when possible. Before the legs are placed underneath the bar, position the prosthesis with your hands or get assistance getting on and off the incline bench.

#### SKILL LEVEL

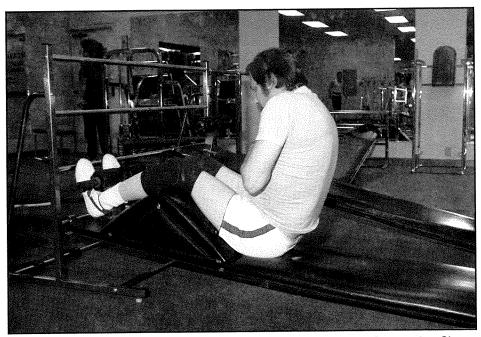
Intermediate.

# NOTE

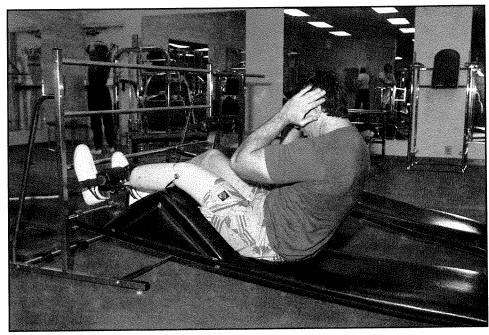
The greater the angle of the bench, the more difficult the sit-up. Beginners should start with the lowest angle. Two types of adjustable incline benches are shown. The incline bench shown in the first two photos supports the bent leg at a 45-degree angle. A more advanced incline bench with no bent-leg support is shown in the latter two photos.

## **CAUTION**

If you have back problems, keep the lower back on the bench and raise your body no further than a half sit-up. Raise the head and shoulders only as high as is comfortable.

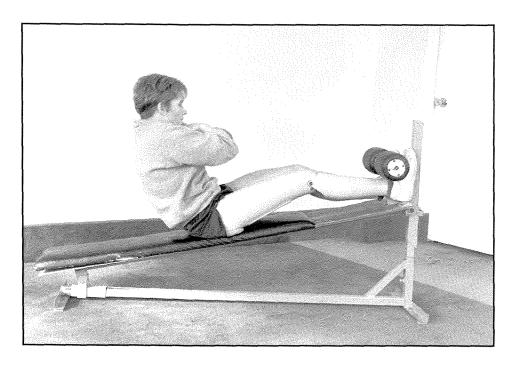


John Everett performs an Incline Bench Sit-up using ActivSleeve Suspension Sleeve with exoskeletal prostheses and Seattle Feet.

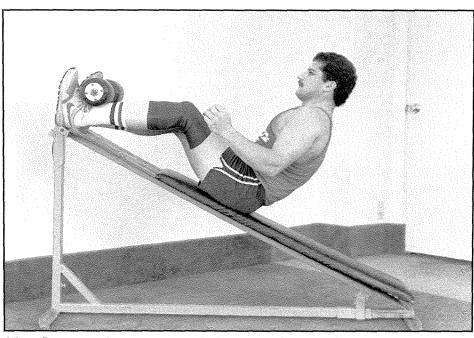


Mike Nitz performs an Incline Bench Sit-Up using the Flex-Foot.

# **EXERCISE 57. INCLINE BENCH SIT-UP WITH VARIATIONS (Continued)**



Linda Pedersen demonstrates a sit-up on an incline bench with no bent-leg support. She is using the Exoskeletal Quad Suction Socket, Mauch SNS Knee Unit, and Otto Bock SACH Foot.



Albert Rappoport demonstrates an Incline Bench Sit-Up with the bench raised to its maximum position for greater difficulty.

# **EXERCISE 58. NAUTILUS ABDOMINAL CHAIR**

# **PURPOSE**

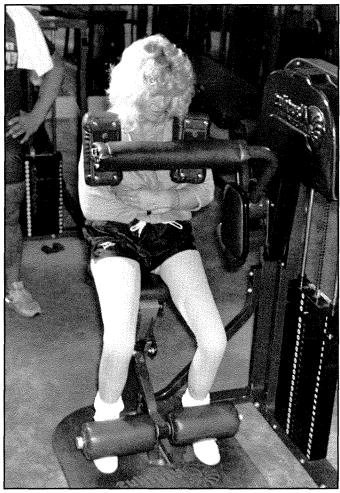
Strengthens the abdominal muscles and hip flexors.

# **PROCEDURE**

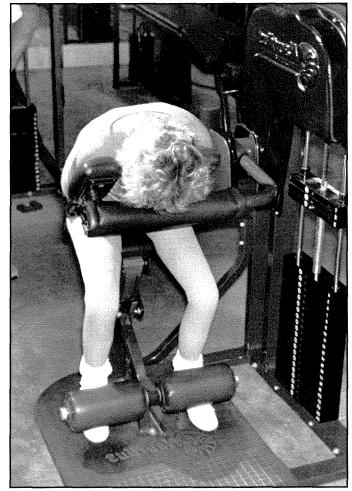
- Sit on the bench and place your feet beneath the ankle pads. Sit straight and position the upper pads so that you can press against them with your shoulders, upper arms, and chest.
- Cross your arms in front of your chest.
- Bend from the waist and push down against the upper pads as far as possible.
- Flex your trunk from the waist, moving your upper body forward and down.
- Pause momentarily, then slowly let yourself back up to the starting position.

# **SKILL LEVEL**

Beginner.

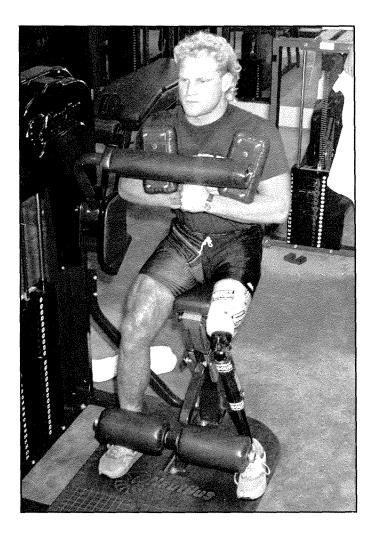


Samantha Ellis demonstrates the starting position.



Ellis pauses before returning to the starting position.

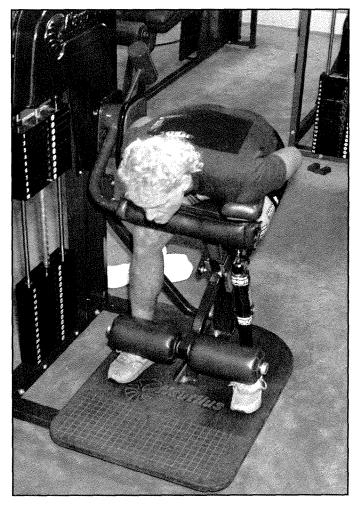
# **EXERCISE 58. NAUTILUS ABDOMINAL CHAIR (Continued)**



Greg Mannino in the starting position for exercise.

NOTE

The Nautilus chair places little stress on the back and resistive weight increases the effectiveness of the exercise. Another advantage of this chair is that an assistant is not needed to hold the legs down.



Mannino in the finish position.

#### **EXERCISE 59. VERTICAL BENCH BENT-KNEE RAISE**

# **PURPOSE**

Develops the lower abdominal muscles and hip flexors.

# **PROCEDURE**

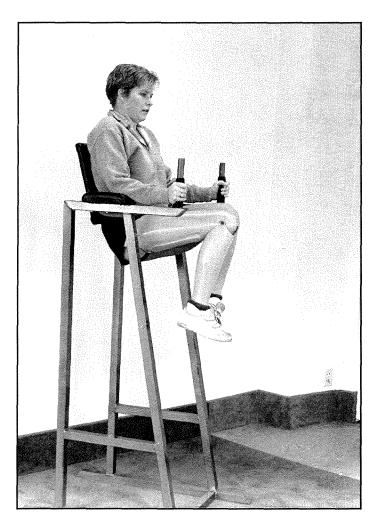
- Place your forearms against the pads of the vertical bench and lock your shoulders out to help support your body weight.
- Keep your back against the back rest. Let your legs hang in a vertical position and then bend your knees and bring them up to waist level or slightly higher.
- Exhale as you raise your legs and inhale as you lower them. Straighten the legs as they are being lowered.
- When bringing your legs up, try not to swing your body. Keep your back against the back rest and use only the abdominal muscles to raise the legs.

# **MODIFICATION**

The sound leg may be pressed against the prosthesis to maintain its position and aid in lifting it.

# **SKILL LEVEL**

Intermediate.



Linda Pedersen pauses before lowering her legs to the starting position.

# **EXERCISE 60. VERTICAL BENCH STRAIGHT-LEG RAISE**

#### **PURPOSE**

Develops the lower abdominal muscles and hip flexors.

# **PROCEDURE**

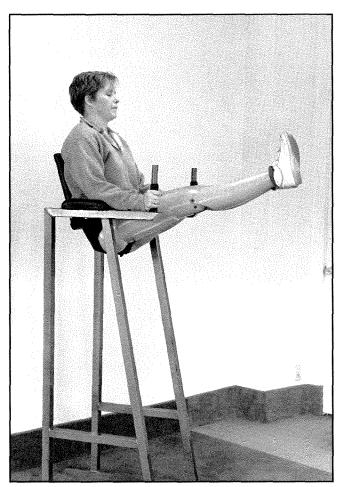
- Place your forearms against the pads of the vertical bench and lock your shoulders out to help support your body weight. Keep your back against the back rest.
- Starting with the legs in the vertical position, bring them up with knees straight until the legs are parallel to the floor or slightly higher. Hold the position momentarily before lowering the legs, making each repetition more challenging.
- Exhale as the legs are raised and inhale as they are slowly lowered to the starting position. Try to keep your back against the back rest and concentrate on using only the abdominal muscles to lift the legs.

# **MODIFICATIONS**

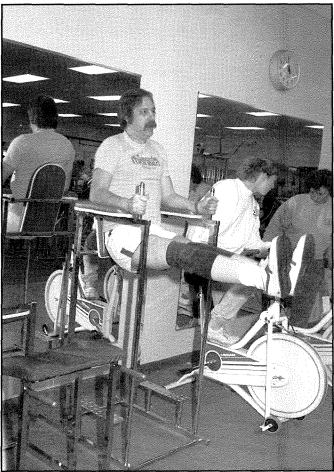
Individuals using an AK prosthesis without a locking knee unit that locks, should keep the sound limb underneath the prosthesis at the heel or keep the legs pressed tightly against each other to prevent the prosthetic knee from flexing and to aid in lifting the prosthesis. Good prosthetic suspension is important. Linda Pedersen uses a quadrilateral suction socket with a Hosmer Red Dot valve. John Everett uses ActivSleeves with a small USMS Adjustable Leak Rate Valve to create suction type suspension. If the exercise is too difficult to complete, raise your legs only part way or use Exercise 61 until you build up adequate strength.

#### SKILL LEVEL

Intermediate.



Linda Pedersen demonstrates the Straight-Leg Raise. Her Mauch SNS Knee Unit is locked in an extended position so that the knee will not flex.



John Everett does the Straight-Leg Raise on a different type of vertical abdominal bench. He keeps his legs up by extending his knees and pressing his heels together.

#### **EXERCISE 61. INCLINE LEG RAISE**

# **PURPOSE**

Strengthens the lower abdominal muscles and hip flexors.

# **PROCEDURE**

- Adjust the incline bench to about a 25-30 degree angle. Position your head at the top of the bench and grasp the bar behind your head with both hands.
- Keep your legs straight and together. Inhale as you raise both legs to at least a vertical position above the hips.
- Keep tension on the abdominal muscles at all times. This may mean not bringing the legs all the way up and not letting the heels rest on the bench when you lower them.
- Do not hold a position or rest during the exercise. While exhaling, lower the legs until they are about 3 inches off the bench. Bring the legs back up and repeat the exercise.

# **VARIATION**

If you wish to include working your oblique muscles, perform one repetition with legs straight as you raise them; the next by twisting your hips as you raise your legs toward your right shoulder, bring legs straight back toward your head, down, and then to the left shoulder. Repeat the sequence, starting with the legs in the center.

# **MODIFICATION**

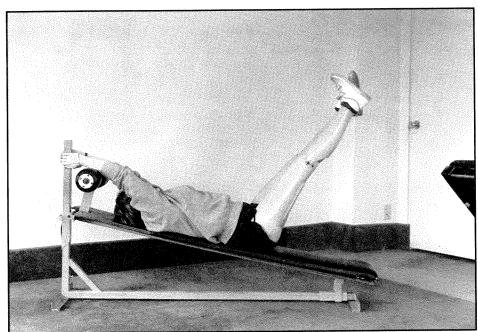
If you are working with a knee unit on an AK prosthesis that does not lock in an extended position, keep the sound limb under the prosthesis at the heel in order to lift it and to maintain a straight knee.

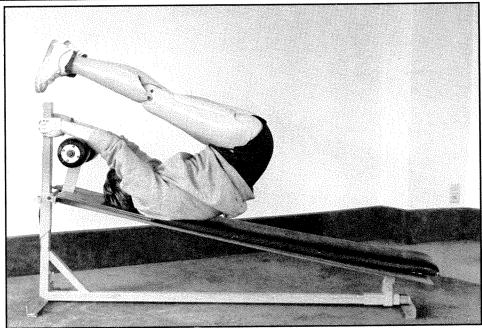
# SKILL LEVEL

Advanced.

#### CAUTION

For those who experience low back pain, the knees can be bent as the legs are raised and straightened as the legs are lowered. Keep the lower back in contact with the bench at all times.





Linda Pedersen demonstrates the Incline Leg Raise.

## **EXERCISE 62. SIDE BENDS WITH DUMBBELL**

# **PURPOSE**

Strengthens the internal and external oblique and erector spinae muscles. Limbers and firms the muscles underlying the "love handles."

# **PROCEDURE**

- Stand with your feet about shoulder-width apart.
- Hold the dumbbell in one hand and place the other hand behind your head (or on your waist if you need stability at first).
- Stand erect and bend to the side at the waist (straight over the hips).
- Return to the starting position. Keep your back straight and do not bend at the hips or knees, only from the waist. Continue the exercise in this manner, bending as far as possible from side to side.
- Change arm and dumbbell positions and bend again from side to side.
- Work up to 15-20 repetitions per side before a rest period. Gradually increase the number of sets to three or four per side.

# **MODIFICATION**

The exercise may be performed sitting down.

# **SKILL LEVEL**

Beginner.

# NOTE

Beginners should perform this exercise without the dumbbells for the first several workouts. Start with a lightweight dumbbell and work up to heavier weights. Do not lift weights that prohibit 15-20 repetitions. Try beginning with 5 pounds and increase the weight by 5 pounds at a time. Concentrate on performing more repetitions, not on lifting heavier weights. You want to tone the obliques and waistline, not add muscle bulk.



Greg Mannino demonstrates the exercise.

# **EXERCISE 63. SIDE BENDS/HYPEREXTENSION BENCH**

#### **PURPOSE**

Strengthens the internal and external oblique muscles.

# **PROCEDURE**

- Position yourself on your side on the seat of the hyperextension bench while crossing your legs underneath the adjacent bar for support.
- Lower your trunk as far as possible.
- Bring your trunk to the highest upright position while remaining on your side.
- Legs can be switched and the body turned around so that both sides can be worked.

# **MODIFICATIONS**

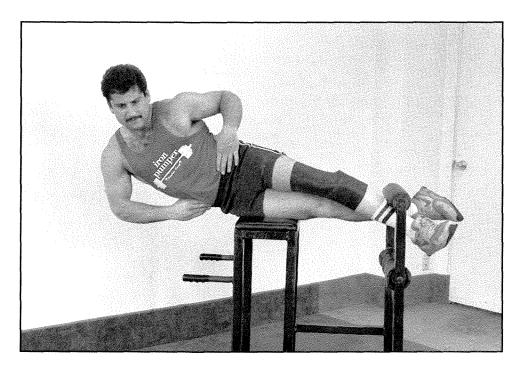
If this position is too difficult, you may work the internal and external obliques while standing or sitting by bending side-to-side or twisting the trunk (see Exercise 62). Holding a dumbbell or weight plate in one hand for increased resistance can be effective.

# SKILL LEVEL

Advanced.

#### NOTE

The position is difficult to assume and maintain, particularly on the first try. While learning this exercise, you should always be assisted by a spotter.



Albert Rappoport uses the ActivSleeve Suspension System to provide the necessary support.

# **EXERCISE 64. STRAIGHT-LEG SIT-UP/HYPEREXTENSION BENCH**

#### **PURPOSE**

Works the upper abdominals and hip flexors.

#### **PROCEDURE**

- Sit on the hyperextension bench and position your feet underneath the bar for support.
- Bend backward until your upper body is lower than the bench.
- Perform a sit-up by raising yourself back to an upright position using only the abdominal muscles.
- Do not bend too far forward when you return to the upright position because that will lessen the tension on the abdominal muscles.

#### **MODIFICATIONS**

ActivSleeve Suspension Sleeves create a suction-type suspension which imparts confidence that the legs will not displace, especially for those with bilateral amputation. Seattle feet are used on the exoskeletal prostheses with New Life Laboratories PM Liner and New Skin cosmetic covering.

# SKILL LEVEL

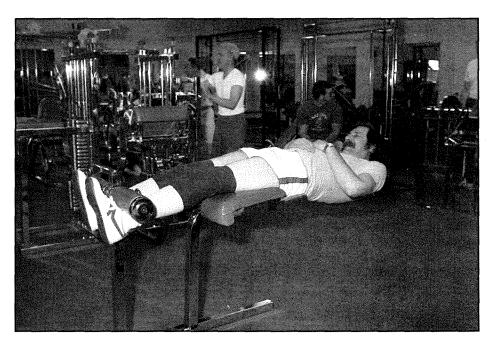
Advanced.

# NOTE

This exercise is particularly challenging because it is difficult to get into the starting position on the hyperextension machine.

# **CAUTION**

This exercise places great stress on the lower back. Avoid in the presence of any back problems.



John Everett performs an advanced variation of the sit-up exercise.

# **EXERCISE 65. EXERCISE WHEEL**

#### **PURPOSE**

Strengthens the abdomen, shoulder extensors, and hip flexors.

# PROCEDURE 1: BEGINNING POSITION (KNEES ON GROUND)

- Lie face down on an exercise mat.
- Starting with the knees on the ground, grab the handles on either side of the exercise wheel and roll it out in front.
- Slowly extend the arms and stretch the body out straight until the back is at least parallel to the ground. Keep the wheel in contact with the ground at all times.
- Bring the body to an upright position. No part of the body from the knees up should be in contact with the floor. Hold the extended position for a few seconds.
- Increase the hold time by a few seconds each time you do the exercise in order to build strength in the abdomen and lower back.
- Repeat 5-10 times for each set; three sets are recommended.

# PROCEDURE 2: ADVANCED POSITION (KNEES OFF GROUND)

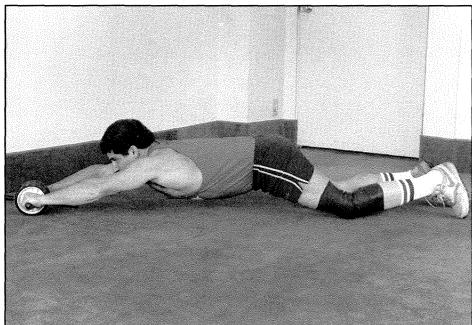
- Begin from a standing position.
- Place the exercise wheel on the floor and roll it forward.
- Extend the legs and arms as the body is lowered to an outstretched position, as seen in the photo. No part of the body may touch the ground.
- Raise the wheel and body back to a standing position while legs and arms continue to be extended.
- The wheel remains in contact with the floor until it reaches the toes. The body is now upright and the exercise may be repeated.
- Repeat 3-5 times for each set; three sets are recommended.

# **MODIFICATION**

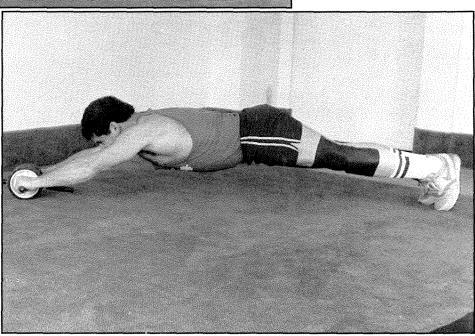
A foot with a keel extending out to the toes is helpful in maintaining balance.

#### SKILL LEVEL

Intermediate to Advanced.



Albert Rappoport demonstrates Procedure 1, Beginning Position: starting from the knees.



Rappoport demonstrates Procedure 2, Advanced Position: starting from the feet with the knees never touching the floor.