

Increasing Physical Activity as We Age

Strength Training

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Introduction

Strength training—also referred to as resistance training or weightlifting—is part of a comprehensive exercise routine which includes endurance or aerobic activity, balance or stability training and flexibility or stretching exercises. Strength training is when we work the skeletal muscles of our bodies harder than they are used to, usually through free weights, resistance bands/tubes or weight machines. Strength training increases strength, anaerobic endurance and muscle mass. The goal of strength training is to grow stronger.

As we age, muscle strength declines. Humans can lose up to one-half of their strength and muscle mass between the ages of 25 and 80 years. Part of this decline is due to the biology of aging; however, the other part of this decline is due to inactivity. What is promising is that progressive strength training for adults and senior adults not only prevents muscle loss but also increases strength and muscle mass, similar to what is observed in young adults. Participating in strength training has many positive benefits for our health.

Why Is Strength Training Important?

Strength training has many important benefits. In addition to



increased strength and muscle mass, strength training also increases bone density. Strength training exercises have been shown to reduce the risk for numerous chronic diseases including diabetes, heart disease, osteoporosis and arthritis. On top of that, strength training has been shown to have many positive effects on psychological health such as reduced depression, improved sleep and greater sense of well-being. Furthermore, strength training is helpful in maintaining a healthy weight.

Exercise Recommendations

Adults and senior adults should do strength training exercises that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders and arms) two to three days a week with a “rest” day in between the strength training sessions. This “rest” day does not mean to forgo doing the other types of exercises—it is specific for strength training. Examples of strength training exercises include lifting or pushing free weights, pulling resistance bands and using strength-training equipment at a fitness center or gym. In some cases, strength

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training can include lifting your own body weight, such as with push-ups or squats.

Categories of Strength Training

Strength training exercises can be classified into three categories:

- **Isometric**—sometimes referred to as “static”—is where no movement occurs; an action in which the muscle develops tension, but does not shorten.

Example: Attempting to pick up the chair you are sitting in or standing with each hand on opposite sides of a doorway attempting to push down the walls.

- **Isotonic**—sometimes referred to as dynamic; contractions in which a muscle shortens against a constant load or tension, resulting in movement.

Example: Using free weights (such as barbells and dumbbells) or commercial weight machines. Isotonic exercises also include variable-resistance exercises such as using stretch bands and exercise tubes as well as commercial devices.

- **Isokinetic**—the exertion of force at a constant speed; action in which the rate of movement is constantly maintained through a specific range of motion even though maximal force is exerted.

Example: Performing the exercise on commercial isokinetic devices. The machine is programmed to move at a certain speed so it will vary its resistance against you to maintain that speed. This means if you push against the machine hard, it will give back a lot of resistance to maintain the speed at which it was told to go.

Although all forms of strength training are beneficial, performing isotonic exercises using free weights (dumbbells and/or barbells) is recommended over the other methods. Research studies have shown that, compared to other methods of weight training, free weights produce greater strength gains during short-term training periods, provide greater movement abilities and involve both balance and stabilizing factors. The disadvantages of free weights include the possibility of injury (such as dropping the weight on your toe), needing a “spotter” for heavy weights and learning the proper lifting technique. That said, it is better to do some kind of strength training than nothing at all.

Progressive Strength Training

The most common form of strength training is weightlifting using free weights or various types of weight machines. In order to improve strength, weight training must push the muscles beyond what they are used to—called *overload principal*—by periodically increasing the amount of weight or resistance used in that particular exercise. This concept is referred to as *Progressive Resistance Exercise* and is the basis for most strength training programs.

How does progressive strength training work? When you first begin, you should start exercising with weights that you can lift at least ten times with only moderate difficulty. If you cannot do at least 8 repetitions, the weight you are using is too heavy and you need to use a lighter weight. If you can do over 12 repetitions, the weight you are using is too light and you need to use a heavier weight. After two weeks of strength training, you should reassess the difficulty of each exercise with your current level of weights.

For example, you may have started doing the biceps curl with a 3-pound weight. By the end of the second week, the exercise has become too easy for you, and you should increase your weights to a 4- or 5-pound dumbbell. At the end of the fourth week, you once again reassess. You may stay with the 5-pound weight one more week or you may move up to a 6- or 8-pound weight. A good way to check to see if you are ready to increase your dumbbell weight or if you should stay the same is to do the exercise with your current weight and count your repetitions. If you can easily lift the current weight dumbbell through the full range of motion and in proper form more than 12 times, you should increase your dumbbell weights by 1 to 3 pounds and see how the exercise feels at the new weight level. With the new weight, you should be able to have correct form for at least 8 repetitions.

When performing strength training exercises, you should only use equipment intended for exercise. There is an increased risk of injury and improper form when using household items as weights. It is also important to note that you will need different size weights for different exercises. For example, a person may be able to perform a wrist curl with a 3-pound weight, the biceps curl with an 8-pound weight and the shoulder press with a 5-pound weight.

Biology of Strength Training

As we age, muscle strength declines. Most of this decline happens after the age of fifty. This loss of strength is mainly from inactivity—not

using our muscles. Another part of the muscle strength decline is due to the aging process. This loss of strength due to aging actually occurs at the *motor neuron* level. The motor neuron is what gives the message from your brain through the central nervous system to the muscle telling it to contract and move. This decline in the motor neuron is a neurological change that occurs with aging. This is important to note because whatever affects the motor neuron affects the muscle fibers attached. So a decline in the motor neuron unit leads to a decrease in muscle fibers (both Type I and Type II muscle fibers). The loss of muscle fibers from those individual motor neuron units results in less available force for a muscle contraction when that motor neuron is stimulated. Once the muscle contraction mechanism is impaired, there is a loss of strength and power. The good news is that regular, progressive strength training can reverse the loss of muscle strength due to the biology of aging.

Strength training not only increases our muscle mass, it also increases our bone density. Bones respond to strength training by increasing their bone density. The bone grows stronger or denser in response to the forces associated with the muscle contraction. As the muscles get stronger, the bone gets strong too. How does this work? Bone is made up of a configuration of bone fibers, blood vessels and lymphatics which is called *osteoid*. Bone responds to stress (such as strength training) and disuse (as in our sedentary lifestyles) by increasing the osteoid in areas that are subject to stress and reducing it in areas where it is no longer needed. Increased bone density is called *sclerosis*. Sclerosis of the bone can result from strength training exercise. It is important to note that bone adaptations are exercise specific. For example, a lower body exercise—such as a squat—will strengthen the leg bones but will not strengthen the bones in the upper body.

Sample Exercises

Be sure to warm up your muscles before you begin strength training. (For more information about the warm-up, see FSFCS34, *Stretching*.) The number of times you perform the exercise is called the *repetitions* or *reps*. The number of times each group of repetitions is performed is called the *set*. For all the following exercises, strive for 2 sets of 10 repetitions. In other words, perform the exercise 10 times, rest for a minute, then do the exercise 10 more times.

Note: When using dumbbells, do not work with two different size weights per hand. Work with the weight of the weaker arm until you can safely progress to the next higher poundage.

Overhead Press, also known as the Military Press. (Works primarily the shoulder muscles with some arm muscles.)

1. Stand with your feet shoulder-width apart and knees straight but not locked.
2. Hold a dumbbell in each hand at shoulder height with palms facing forward. See *Figure 1: Overhead Press Starting Position*.
3. Slowly raise both arms up over your head, keeping your elbows slightly bent and in line with your body.
4. Pause for a breath, approximately 1 second. See *Figure 2: Overhead Press*.
5. Lower the dumbbells back to your shoulders.

Note: If you are unable to reach your arms over your head due to surgery or other medical precautions, you can do the side arm raise as an alternate shoulder exercise. The overhead press and the side arm raise both work the shoulder muscle. You do not need to do them both.



Figure 1. Overhead press starting position.



Figure 2. Overhead press.

Side Arm Raise With Bent Arm (Works the shoulders.)

1. This exercise can be performed standing or seated. Keep your feet shoulder-width apart with feet flat on the floor.
2. Holding a dumbbell in each hand, keep your arms by your side, bend your elbows to a 90-degree angle. See *Figure 3: Side Arm Raise Starting Position* and *Figure 4: Side Arm Raise Starting Position, Side View*.
3. Keeping the bend in your elbows, raise both arms to the side, shoulder height. See *Figure 5: Side Arm Raise* and *Figure 6: Side Arm Raise, Side View*.
4. Slowly lower your arms back to your side.



Figure 3. Side arm raise starting position.



Figure 4. Side arm raise starting position, side view.



Figure 5. Side arm raise.



Figure 6. Side arm raise, side view.

Biceps Curl (Works the biceps muscle, which is the front muscle of the upper arm)

1. Stand with your feet shoulder-width apart and knees straight but not locked.
2. Hold weights straight down at your side, palms facing inward. See *Figure 7: Biceps Curl Starting Position*.
3. As you slowly bend your elbows to lift the weights towards your shoulders, rotate the weight so that your palms are facing your shoulders. See *Figure 8: Biceps Curl*.
4. Slowly lower the weights, rotating your arms back to the starting position.

Note: As a variation of the biceps curl, you can do this exercise seated and one arm at a time. See *Figure 9: Seated Biceps Curl Starting Position* and *Figure 10: Seated Biceps Curl*.



Figure 7. Biceps curl starting position.



Figure 8. Biceps curl.



Figure 9. Seated biceps curl starting position.



Figure 10. Seated biceps curl.

Triceps Kickback (Works the triceps muscle group, which is the back of the upper arm.)

1. This exercise can be performed standing or seated. Keep your feet shoulder-width apart with feet flat on the floor.
2. Hinge at your hips, lowering your torso to form a 45-degree angle. Be sure to lift your chest and tighten your abdominal muscles. Your upper arms should be lifted to the level of your back with your elbows bent. Keep your upper arms and elbow close to your body. *See Figure 11: Triceps Kickback Starting Position.*
3. Slowly extend the lower part of your arm until it forms a straight line with the upper arm. Avoid locking out your elbow joint while keeping your wrist straight. *See Figure 12: Triceps Kickback.*
4. Keeping your upper arms and elbows close to your torso, lower the dumbbells to the starting position in a controlled motion.



Figure 11. Triceps kickback starting position.



Figure 12. Triceps kickback.

Wide Leg Squat (Works the front, back and inner thigh muscles as well as the buttocks.)

1. Stand with your feet slightly greater than shoulder-width apart, crossing your arms in front of your chest. *See Figure 13: Wide Leg Squat Starting Position and Figure 14: Wide Leg Squat Starting Position, Side View.*
2. Keeping your chest lifted and your back, neck and head in a straight line, slowly lower yourself back to a seated position. *See Figure 15: Wide Leg Squat and Figure 16: Wide Leg Squat, Side View.*
3. Stand up slowly, pushing up from your heels through your lower legs, thighs, hips and buttocks. Be sure your knees do not move in front of your toes.

Note: When you are first learning the wide leg squat, you can stand behind a high back chair and hold on for balance.



Figure 13. Wide leg squat starting position.



Figure 14. Wide leg squat starting position, side view.



Figure 15. Wide leg squat.



Figure 16. Wide leg squat, side view.

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