

# Research Update

Practical, leading edge research results applied to physical activity for older adults, in plain language for health practitioners and leaders.  
 Sponsored by the Active Living Coalition for Older Adults (ALCOA)



## The Power of Strength Training for Older Adults

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*Français au verso*

**I**n the 1990's research on strength training for older adults exploded. Before that, health experts merely encouraged older adults to do aerobic training to prevent or treat cardiovascular disease. However, people have started living longer and it is important to help them stay as independent as possible in all areas of their lives.

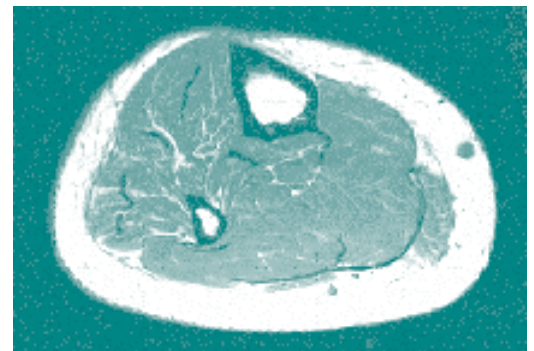
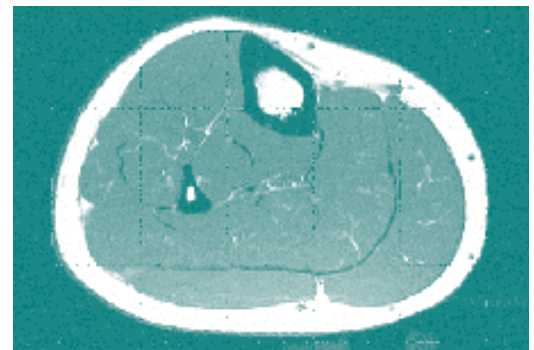
Thus, experts now recommend that older adults also do strength training to maintain their strength, muscle mass and balance.

### Why is it important for older adults to do strength training?

As people age, they can lose a great deal of strength and muscle mass (see Figure 1). This can affect their day to day functioning. When people reach their 70's or even earlier, they may not be able to:

- Lift groceries
- Climb stairs
- Do heavy housework or gardening
- Cross the street quickly enough to keep up with the traffic lights
- Pick up their grandchildren

What's more, older adults who are losing muscle mass and are inactive have an increased risk of disability, falls and diseases such as diabetes.



**Figure 1.** The MRI (magnetic resonance image) on the top is from the lower leg of a younger woman. The one on the bottom is from an older woman. The older woman has lost muscle (dark areas), gained body fat (white areas) and also has more fat and connective tissue (white areas) inside the muscle.

### What does the research say about strength training?

Age does not seem to limit people's ability to get stronger when they do strength training. Hundreds of studies

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show that older adults can safely get stronger, even in a short time. This is true if the person is an athlete or a frail 95-year-old. Older adults have increased their strength from 10 to over 100 percent in just eight weeks. Some older adults have even reached a strength level equal to someone 20 years younger.

Muscle can still grow and develop even in people over 90. However, this increase in size does not totally explain the resulting increase in strength. Researchers still do not know why, but it seems that during strength training, there are changes in the nervous system that increase strength. These changes possibly happen in the body's neuro-muscular system.

This finding has an impact on strength training. People should do strength exercises that are similar to their daily activities. For example, if people want to get up from a chair, their strength training exercise should be as similar to this activity as possible. If people want to improve their balance, they can do strength exercises while they are standing.



## What are the benefits of strength training?

Strength training has many health and fitness benefits. Improvements in strength are the most dramatic. Other benefits include:

- An increase in bone density
- An increase in muscle size
- An increase in basal metabolic rate
- A decrease in body fat
- A decrease in diabetes risk factors and symptoms

Strength training can also reduce the risk of falls and improve daily physical functioning, including walking speed, reaction time and the ability to climb stairs and get out of a chair.

Even older people who do a lot of aerobic activities benefit from strength training. Strength training may prepare frail older people for aerobic activities.

## Who can do strength training?

There are few reasons to prevent any older adults from taking part in strength training programs. For example, many

PAR-Q and PARMedX are available from Canadian Society of Exercise Physiology. [www.CSEP.ca](http://www.CSEP.ca)  
Tel: 613 234-3755

people with arthritis find that it helps reduce joint pain.

People who are frail or have a disease may benefit the most from strength training.

Health Practitioners can use the PAR-Q (Physical Activity Readiness Questionnaire) to find out if older adults should check with their physician before they start a new strength training program. If they answer 'yes' to any part of PAR-Q, older adults can be recommended to meet with their family physician using the PARMedX (Physical Activity Readiness Medical Examination) to evaluate their readiness for activity.

### Who should not do strength training?

According to the American College of Sports Medicine, people should delay or avoid exercising and get medical advice if they have:

- An unstable or uncontrolled condition, for example unstable or uncontrolled diabetes, chest pain or high blood pressure.
- A hernia or a cataract and are being treated for it
- Retinal bleeding
- Recent joint or bone injuries

People should be advised not to do physical exercises if they have:

- An uncontrollable heart condition, for example, severe rhythm abnormalities brought on by exercise
- End stage of congestive heart failure
- A rapidly developing terminal illness
- A cognitive impairment that causes them to get upset when they exercise

### Safety tips for strength training:

Participants:

- Will have the best results if qualified instructors supervise their strength training
- Need to use the proper weight and techniques to get the most benefits and to avoid injury
- Should breathe naturally and not hold their breath when doing strength training
- Should lift and lower weights with the same controlled even speed
- Will probably need help with transfers if they are frail

### Which muscle groups to exercise:

Participants should exercise all their major muscle groups, including:

- ✓ Shoulders and upper arms, including biceps and triceps
- ✓ Chest, back extensors and abdominal muscles
- ✓ Hip extensors, knee extensors, ankle plantar and dorsi flexors

Photos:

Canadian Centre for Activity and Aging

Deer Lodge Centre

National Indian and Inuit Community Health Representatives Organization





### **How to choose the right weight:**

- ✓ At the beginning of a strength training program, participants can start with a weight that they can lift 15 or more times in a row.
- ✓ The amount of weight people choose should be geared to their ability. If they can lift a weight less than eight times, it is too heavy. If they can lift it more than 15 times, it is too light.
- ✓ If the weight is too heavy, participants will not be able to use the proper technique and may injure themselves.
- ✓ If the weight is too light, it will not help people to get stronger or develop their muscles.
- ✓ Participants should start slowly but challenge their muscles by gradually increasing the amount of weight over several months until they reach a maintenance level.

### **How many sets to do:**

- ✓ A 'set' is 8 to 12 or 10 to 15 repetitions of the same exercise.
- ✓ Most people should do 8 to 12 repetitions in one set.
- ✓ Frail participants should start at 10 to 15 repetitions in one set.
- ✓ At the end of a set, participants should be unable to lift the weight another time.
- ✓ They will get the greatest benefit by doing two to three sets.
- ✓ Allow two minutes of rest between each set.

### **How often to do strength training:**

- ✓ Participants should train two to four times a week if they want to increase their strength.
- ✓ Allow for at least one day of rest before training the same muscles again.

### **How to progress:**

- ✓ Progression is a key part of strength training. It means that participants gradually increase the weight they are lifting so they can increase their strength.
- ✓ Over several weeks, people should



gradually increase the weight they are lifting for each exercise. It needs to be challenging enough that they can only lift it 8 to 15 times in a row.

### **Maintenance:**

- ✓ After a few months of steadily increasing the weight, participants should meet their strength objective.
- ✓ At this point they move into the maintenance stage and continue using the same weight, training once a week.

### **The importance of 'eccentric' contractions:**

- ✓ Participants should do both the muscle shortening and lengthening part of the exercise activity in a controlled way. For example, when people do arm curls to train their biceps, they should use control when they lift and lower the weight.
- ✓ The lowering movement is called an eccentric contraction and is largely responsible for the muscle development that happens. It is important that people do not miss this part of the exercise by dropping the weights to the floor.
- ✓ However, eccentric contractions may cause muscle soreness so people should not stress this movement too much. Participants should lift and lower weights with the same control and speed.

## How to choose equipment:

The chart on page 6 lists the types of strength training equipment with their advantages and disadvantages. Equipment accessibility and safety is important. It should also let the person lift enough weight and gradually increase it .

It may be hard to find equipment designed for older adults. Most weight training machines were designed for young, male athletes and may need to be modified.

## What is in the future?

Researchers are now looking at the benefits of power training. Unlike strength training, power training involves speed. Studies show that people may benefit more from having power rather than strength when they are doing daily tasks.

For now, people should still be cautious about adding speed to their strength exercises. However, as research continues, there will be more information about this exciting new type of training.

*The views expressed in this newsletter are those of the authors and do not necessarily reflect those of Health Canada.*

## Some useful web sites

### ■ Active Living Coalition for Older Adults:

Web sites related to strength training for older adults are listed.

[www.ALCOA.ca](http://www.ALCOA.ca)

### ■ American College of Sports Medicine

1. Exercise and Physical Activity for Older Adults (Position Stand)
2. The Recommended Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Muscular Fitness and Flexibility in Healthy Adults (Position Stand)

[www.acsm-msse.org/](http://www.acsm-msse.org/)

### ■ The Arthritis Society

[www.arthritis.ca](http://www.arthritis.ca)

### ■ Canadian Centre for Activity and Aging

[www.uwo.ca/actage](http://www.uwo.ca/actage)

### ■ Canada's Physical Activity Guide to Healthy Active Living for Older Adults

[www.paguide.com](http://www.paguide.com)

### ■ Canadian Society for Exercise Physiology

Source of PAR-Q and PARMedX

[www.csep.ca](http://www.csep.ca)

### ■ Journal for the American Medical Association (JAMA)

\*\* Women, exercise, and aging: strong message for the "weaker" sex.

### ■ The Physician and Sportsmedicine

1. \*\*Strength Training: Rationale for Current Guidelines for Adult Fitness Programs
2. \*\*Recommending Exercise to Healthy Older Adults - The Preparticipation Evaluation and Exercise Prescription
3. \*\* Exercise for Older Patients With Chronic Disease

[www.physsportsmed.com](http://www.physsportsmed.com)

### ■ National Institute on Aging, USA

[www.nih.gov/nia/](http://www.nih.gov/nia/)

### ■ Osteoporosis Society of Canada

[www.osteoporosis.ca](http://www.osteoporosis.ca)

\*\* web sites accessed through [www.ALCOA.ca](http://www.ALCOA.ca)

# How to choose equipment

Type of equipment or activity	Advantages	Disadvantages
<b>Body weight</b> (for example, push ups)	<ul style="list-style-type: none"> <li>• free</li> <li>• always available</li> </ul>	<ul style="list-style-type: none"> <li>• may not be a suitable starting weight (too light or too heavy)</li> <li>• may not allow progression</li> <li>• exercise positions may not be suitable for everyone</li> </ul>
<b>Heavy housework or yard work</b> (for example, shoveling snow)	<ul style="list-style-type: none"> <li>• free</li> <li>• close by</li> <li>• needs to be done</li> </ul>	<ul style="list-style-type: none"> <li>• a person may not always be able to start slow or stay within their physical capabilities</li> </ul>
<b>Elastic tubing or bands</b>	<ul style="list-style-type: none"> <li>• not expensive</li> <li>• can be done anywhere</li> <li>• portable</li> <li>• suitable for many muscle groups</li> </ul>	<ul style="list-style-type: none"> <li>• may not be suitable resistance for strong muscle groups</li> <li>• does not ensure proper technique is used</li> <li>• does not use natural movements</li> </ul>
<b>Wrist or ankle weights</b>	<ul style="list-style-type: none"> <li>• not expensive</li> <li>• portable</li> <li>• suitable for many muscle groups</li> </ul>	<ul style="list-style-type: none"> <li>• may only allow limited progression</li> <li>• does not ensure proper technique is used</li> </ul>
<b>Free weights</b> (for example, dumbbells and barbells)	<ul style="list-style-type: none"> <li>• not expensive</li> <li>• portable</li> <li>• suitable for many muscle groups</li> <li>• can be done standing</li> <li>• may imitate more natural tasks</li> <li>• can help with balance when the person stands and has to control the weight and maintain the technique</li> </ul>	<ul style="list-style-type: none"> <li>• does not ensure proper technique is used</li> <li>• can be dropped by users</li> <li>• may be an uncomfortable movement for people who find it painful to grip</li> </ul>
<b>Weight stack machines</b>  (most strength training research has used this type of equipment)	<ul style="list-style-type: none"> <li>• allows progression</li> <li>• puts user in the correct position</li> <li>• balances or controls the weight so user does not have to do this</li> </ul>	<ul style="list-style-type: none"> <li>• not always available</li> <li>• expensive</li> <li>• may cost money to use</li> <li>• may be too much starting weight or weight increases may be too much for an older person</li> <li>• may not fit the size of the user's body</li> <li>• may be difficult for people who use walkers or wheelchairs to do positioning and transfers</li> <li>• does not imitate natural movements</li> </ul>
<b>Air pressure or hydraulic machines</b>	<ul style="list-style-type: none"> <li>• similar to weight stack machines except that the weight can be more finely tuned</li> </ul>	<ul style="list-style-type: none"> <li>• may be difficult for people who use walkers or wheelchairs to do positioning</li> <li>• does not imitate natural movements</li> <li>• more expensive to buy and operate than weight stack machines</li> </ul>
<b>Isokinetic dynamometers</b>	<ul style="list-style-type: none"> <li>• allows user to control speed of movement</li> <li>• able to exactly match the person's capabilities</li> </ul>	<ul style="list-style-type: none"> <li>• very expensive</li> <li>• must be operated by experts</li> <li>• only available in rehabilitation centres and research facilities</li> <li>• moves at a set speed which is not natural for the user</li> </ul>