

Exercising to help prevent osteoporotic fractures: guidelines

Prepared by Professor Maria Fiatarone Singh, the John Sutton Chair of Exercise and Sport Science, School of Exercise and Sport Science, and Professor of Medicine, University of Sydney, NSW.

As we age our bones lose minerals and can become weak and brittle, causing the condition called osteoporosis. The best way to enhance bone health and prevent fractures due to osteoporosis is a combination of exercise, adequate nutrition and, when required, medication. In middle aged and older people, rapid, short bursts of high intensity activity have been shown to improve the density of bone and the strength of muscles more effectively than other forms of exercise. This exercise can be done in structured classes or in the home.

The principles of exercising to promote bone health described in this handout are relevant for healthy adults and for those with osteoporosis or other medical conditions. However, if you have osteoporosis or any other medical conditions you should see your general practitioner for guidance on exercises suited to your needs.

Types of exercise that promote bone health

Weight-bearing aerobic exercise

Weight-bearing exercises are those that use the large muscle groups in a rhythmic pattern and are performed in a standing position. These exercises should be done at a rate that increases your heart rate, blood pressure and breathing to at least a 'moderately hard' level. Examples are brisk walking, hiking, stair climbing, jogging and aerobic dance. Swimming, cycling, seated exercises and arm exercises are nonweight-bearing aerobic exercises and have little effect on bone health. Aerobic exercise is also known as endurance or cardiovascular exercise.

Resistance training

Resistance training is also known as strength training or weight lifting. It is the use of targeted muscle groups to lift and lower moderate to heavy weights. In traditional weight lifting, the weight is lifted and lowered slowly; in power training, it is lifted as fast as possible and then lowered slowly. Exercises can be machine-based (e.g. leg press, seated rowing, pulldown and knee extension) or done using free weights, i.e. dumbbells or ankle weights (e.g. knee extension and flexion, hip extension, flexion and abduction, leg raises, shoulder strengthening, biceps curl and triceps lift).

This handout outlines the principles of exercising to enhance bone health and help prevent osteoporotic fractures.

Sample exercises are given in a separate MedicineToday handout.

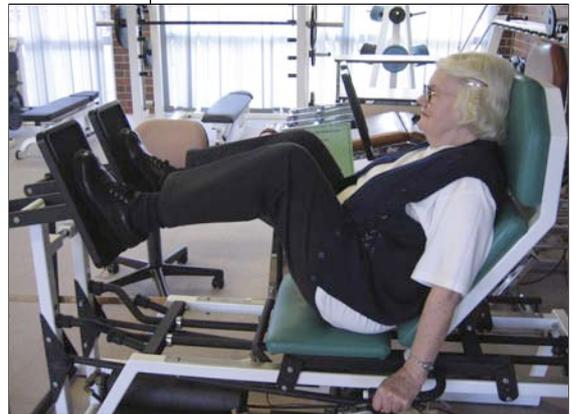


Figure 1. Weight lifting improves bone health. Exercises can be done on weight machines (such as the leg press) or using free weights (dumbbells and ankle weights).



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High impact exercise

In high impact exercise, the bones of the spine and legs incur high stresses as the feet hit the ground. Examples include skipping with a rope, jumping or hopping (including up and down stairs and on and off boxes) and sports involving jumping, such as basketball and netball. Fast heel drops (fast drop of the heel over the edge of a step, with a sudden stop, then slow raise) are a more suitable form of high impact exercise if you have had a previous injury or have osteoarthritis of the knees or hips.

Balance training

Balance exercises stress the body's sense of balance by decreasing foot contact with the ground, changing the centre of mass and removing vision. Examples include standing on one leg with eyes closed, sitting on an exercise ball, heel-to-toe walking (heel of one foot directly in front of the toes of the other foot, so they touch or almost touch), stepping sideways over an object, leaning as far as possible in all directions while standing without bending at your waist, tai chi and balancing while placing a pillow or rocker board under your feet.

Principles of exercising to enhance bone health

- Short bursts of high intensity and/or high impact activities such as jogging, jumping and skipping are more stimulating to bone than sustained, low impact activities such as walking. The higher the impact, the greater the benefit to the bones.
- Exercise has to get progressively harder to continue to improve bone health. Over time the weights lifted need to be heavier, the incline of walking or jogging steeper, the height of jumps greater and the difficulty of balance exercises more challenging (e.g. by removing hand support).
- Exercise does not have to be weight-bearing to enhance bone health. Resistance training done in the sitting or lying position (nonweight-bearing) improves bone health. However, aerobic activities that are nonweight-bearing (such as swimming or cycling) have little effect on bone health although they are good for aerobic fitness.
- Lifting heavy weights improves bone health more than lifting light weights.
- Rapid movements are more stimulating to bone than slow movements. Lifting heavy weights rapidly (power training) seems to be more effective than lifting heavy weights slowly (traditional resistance training).
- Exercise involving changes of direction and different height jumps is more stimulating to bone than exercise involving repetitive actions.
- Exercising in short bouts with rest periods between seems to improve bone strength more effectively than continuous, long periods of exercise.
- Muscles connected to bones that are prone to osteoporotic fracture (i.e. bones of the hip, wrist and thoracic spine) need to be strengthened to achieve protection for those bones.
- Balance training improves mobility and confidence, reducing falls and the fear of falling.

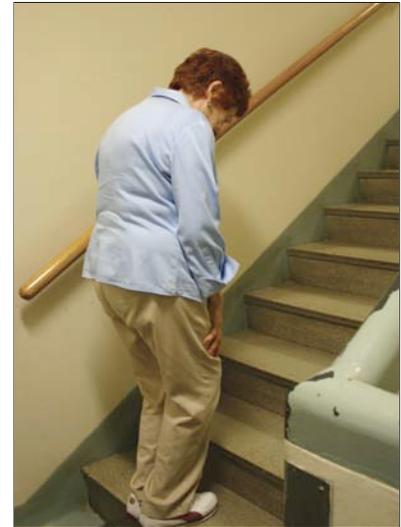


Figure 2. High impact exercise has recently been shown to be particularly beneficial to bone health. Jumping up and down stairs is an example of a high impact activity.



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Guidelines for resistance training using free weights

Equipment

You will need a set of ankle cuffs with removable 0.5 kg weights. Have a total of 10 kg per leg. Also have a set of adjustable dumbbells or fixed weight dumbbells of various sizes ranging from 1 kg to about 20 kg. You will also need a sturdy chair with a straight high back and no arms.

Muscle groups

The major muscle groups to target in a balanced resistance training program are the arm muscles (biceps and triceps), upper torso muscles, lower abdomen muscles, muscles around the hip, thigh muscles (quadriceps and hamstrings) and calf muscles. Details of appropriate exercises are available in the *Medicine Today* patient handout entitled *Exercising to help prevent osteoporotic fractures: exercises*. Physiotherapists and qualified fitness trainers can also give you advice on exercises and may run suitable programs.

Amount and frequency

Exercise two or three times per week, with at least one day of rest between sessions. Do two or three sets of eight repetitions of each exercise per session, with at least one minute of rest between sets. Each session should take 30 to 45 minutes. Keep a record of each session (date, exercises performed, weights used and numbers of repetitions done).

Technique

Breathe out as you lift a weight and in as you lower it; don't hold your breath. Perform each movement slowly, through the full range of motion, taking about 6 to 9 seconds for each repetition and 2 to 3 seconds of rest between lifts. Don't swing the weight or use momentum to complete the lift.

Progression

For effective resistance training, the weight should feel hard to lift. As soon as lifting the weight for two sets no longer feels hard, move up to the next weight.

Enhancing balance

If necessary, hold on to the back of the chair for support during weight lifting exercises performed in the standing position, such as hip extension, flexion and abduction. As your balance improves, progress from using two hands on the chair to one hand, one fingertip, no hands, and then no hands and eyes closed.

Enhancing bone growth and strength

The rest period between sets of weight lifting exercises can be used for high impact exercise. For example, perform one jump between each set, aiming for a total of about 20 to 60 jumps per week. If wearing ankle weights, keep them on for the jump.



Figure 3. Hip extension is one of the several exercises done to strengthen the muscles in the lower back–hip–thigh region, so as to protect the bones of the hip from osteoporotic fracture.



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Exercising without any equipment

You can incorporate balance and high impact exercises into your daily activities if you don't have access to weight lifting and other equipment. Some simple exercises are listed here.

- Stand on one leg whenever you are standing at a sink or counter or in a queue.
- Walk heel-to-toe between rooms (place the heel of one foot directly in front of the toes of the other foot, so that they touch or almost touch).
- Stand up and sit down slowly without using your arms.
- Squat to pick up items or reach into low shelves or drawers, rather than bending over.
- Jump up and down steps and stairs using both feet to land; advance to one leg hops. If your balance is poor, start by holding on to a railing.
- Lift items with one hand instead of both.
- Avoid having poor posture, particularly forward flexion of the spine. To improve your sitting posture, sit on a Swiss ball or a backless chair.

Be careful

- If you have osteoporosis or any other medical conditions, consult your general practitioner before beginning an exercise program.
- If you have poor balance or a history of osteoporotic fracture, you will require specific exercise programs for enhancing bone health and you should always exercise under supervision.
- Exercise under supervision at least until you are sure your technique is correct.
- Everyone at risk for osteoporotic fracture should avoid physical activities involving forward bending of the spine, particularly while carrying an object, because of the risk of compression fractures of the vertebrae. These activities include sit-ups with straight legs, lawn bowls and simply bending over to pick up something from the floor.
- Avoid physical activities that are associated with a high risk of falls.
- Avoid hazardous environments that may lead to falls.

More information

Sample exercises are given in the *Medicine Today* patient handout, *Exercising to help prevent osteoporotic fractures: exercises*. Ask your general practitioner for a copy if you haven't already got one.

Further information can be obtained from the websites of the following organisations:

- Osteoporosis Australia – www.osteoporosis.org.au
- Fit For Your Life Foundation – www.fitforyourlife.org
- Centre for Strong Medicine, Balmain Hospital, Sydney – www.strongmedicine.md
- COTA (Council on the Ageing): Living Longer Living Stronger program – www.cota.org.au

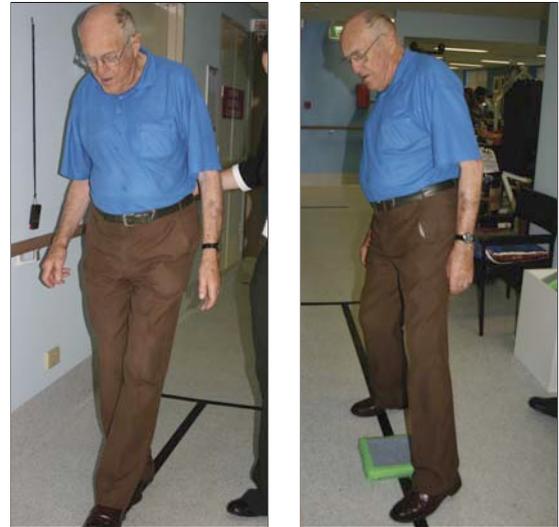


Figure 4. Balance exercises such as heel-to-toe walking (above left) and side stepping (above right) improve mobility and confidence, reducing both falls and the fear of falling.



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