

Exercise and osteoporosis

How exercise can help with bone health,
fragile bones and fractures



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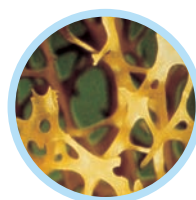
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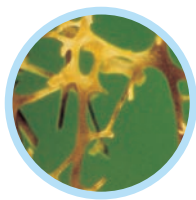
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What is osteoporosis?

Osteoporosis occurs when the struts that make up the mesh-like structure within bones become thin, causing bones to become fragile and break easily, often following a minor bump or fall. These broken bones are often referred to as “fragility fractures.” The terms “fracture” and “broken bone” mean the same thing. Although fractures can occur in different parts of the body, the wrists, hips and spine are most commonly affected. Spinal fractures can also cause loss of height and curvature of the spine.



Strong dense bone



Fragile osteoporotic bone

Introduction

Everyone knows the old adage that exercise is good for you. It can certainly make you feel better and has been linked positively with many aspects of our general health, including the strength of our bones.

This booklet will be useful if you:

- Wish to use appropriate exercise to help prevent osteoporosis and fragile bones.
- Have been told you have fragile bones or have had a diagnosis of osteoporosis following a bone density scan and want information about appropriate exercise.
- Have broken bones as a result of osteoporosis and want to help prevent further fractures and reduce pain through exercise.

Exercise recommendations

Children should undertake 60 minutes of moderate-intensity physical activity each day.

Adults should be doing 30 minutes of moderate-intensity physical activity at least five days a week (or 150 minutes or more in total). They should also undertake physical activity to improve muscle strength on at least two days a week.

Older adults (over the age of 65) who are at risk of falls should also incorporate specific exercises to improve balance and co-ordination on at least two days a week and reduce the amount of time spent being sedentary (sitting) for extended periods.

(Department of Health 2009 and 2011 recommendations from the Chief Medical Officer)

Definitions

Physical activity is considered to be any muscular movement beyond resting levels. It is an all-encompassing concept that includes any functional activities of daily living or planned leisure pursuits (exercise and sport).

Exercise is typically a planned and/or structured physical activity that has an aim. The aim is usually to satisfy a physical, psychological or social need or often a mixture of all three.



Exercise and bone strength

Bone is a scaffold that supports the body against the forces of gravity and resists the pull of the muscles to allow movement. These loads and forces ensure that the skeleton remains able to resist the everyday burdens imposed upon it. Bone is a living tissue that reacts to increases in loads and forces by growing stronger. It does this all the time, so exercise will only increase bone strength if it increases the loading above normal levels. Younger, active people produce more new bone tissue than they lose, and therefore their bone density increases. Generally we achieve maximum bone density and strength (peak bone mass) around the age of 30. Bone density gradually begins to decline as we age, and most of us also become less active. For women, bone loss is usually most rapid during the first few years after menopause. Exercise, healthy eating and other lifestyle changes can slow the bone loss that usually occurs as we age and may help to reduce the risk of our bones breaking.

If you are new to exercise or thinking of starting something new, choose an activity that is compatible with your lifestyle, that you enjoy and that is effective for improving bone strength. Not all forms of exercise stimulate bone. Exercise that is useful for reducing the risk of heart disease will not necessarily build bone density. Swimming and cycling, for example, are excellent forms of exercise for improving the fitness and function of the heart and lungs, but these activities are not weight-bearing and do not affect bone density.

Weight-bearing exercise: any exercise in which you are supporting your own body weight through your feet and legs (or hands and arms).

Regular exercise is important throughout life, regardless of your age. The benefits in post-menopausal women and men over 50 are very well documented and will be particularly relevant to readers of this booklet. Exercise in these groups has been shown to:

- Minimise bone loss and possibly reduce the risk of broken bones
- Increase muscle strength
- Improve balance
- Improve your sense of wellbeing
- Improve cognitive (brain) function
- Make you better able to carry out daily tasks and activities
- Maintain or improve posture
- Relieve or decrease pain associated with other conditions such as osteoarthritis
- Reduce the risk of falls
- Reduce the risk of many medical conditions



Exercising safely

There are some important dos and don'ts you should be aware of, to enable you to take up a more active lifestyle in a safe and effective way.

It is important not to rush into unaccustomed exercise too quickly.

Begin with activities you know you can do comfortably and then gradually increase the amount and intensity until you have reached your target. This will take time.

Exercise must be taken regularly to have any benefit.

Little and often is needed (30 minutes, five days per week). If you forget to clean your teeth during the week, you do not clean them seven times on Sunday!

A little muscle stiffness for a day or two after exercise indicates that you have done more than usual; this will stimulate improvements.

However, persistent pain may be a sign of injury and if it persists for longer than a few days you should arrange to see your Doctor.

Think carefully about undertaking activities that may increase the chance of a fall.

If you have been diagnosed as having fragile bones, you are more likely to break bones if you fall.

Always maintain an upright posture.

It is best to avoid too much forward flexion (curving the spine forwards), such as touching the toes. This is particularly important if you have had a compression fracture of the spine. See page 34 for more information about this.

Warm up and cool down Always warm up gradually before physical activity and exercise and take time to cool down afterwards to prevent injury and gain maximum benefit.

Consult your doctor before starting any exercise programme.

If you have osteoporosis and you are unsure how your diagnosis may affect what you can and can't do, speak to your doctor or health professional about your risk of fracture.

Ground rules for safe exercise

Clothes and footwear

Wear sensible, comfortable flat shoes or trainers and comfortable clothes.

Environment

Make sure you have enough space to move, and that the room temperature is set to make sure you will not get too hot or too cold.

Warm-up

Use gentle exercise to warm up before you begin your main exercise. Muscles and joints work most effectively when they are warm and the risk of injury is reduced. A useful way to start your warm-up is a combination of walking, marching and sidestepping to increase your circulation. Then complete the warm-up with joint-mobilising and stretching exercises. To help you balance, you can perform these exercises holding onto a chair or near a wall.





◀ Walk

Check your posture and tighten your abdominals (pull your tummy button in gently as if you are trying to do up a pair of very tight trousers!). Walk on the spot, keeping your toes on the floor. Lift your arms with each step.

Continue for two minutes.

March ▶

March gently on the spot, lifting the opposite arm towards the lifted knee.

Continue for two minutes.



◀ Side-step

Step to the side, transferring your weight from the ball to the heel of your foot. Bring your other foot across to touch the floor. Repeat to the other side. Swing your arms in the direction of the step.

Continue for two minutes.



Warm-up stretches

Next perform some slow, controlled joint-mobilising exercises such as shoulder circles and side bends. Alternate these with the circulation warm-up exercises already described.

Ensure that you have been warming up for a minimum of 10 minutes before moving on to the warm-up stretches. Move slowly into and out of each stretch and limit the hold for each warm-up stretch to a slow count of eight (approximately eight seconds).

Once you've completed your warm-up, you are ready for your main training workout. This could be some moderate physical activity such as walking or stairclimbing, or exercise (as described on the next few pages).

Complete your session by performing some cool-down stretches to improve flexibility.



Shoulder circles



Side bends



Post-exercise stretches

Stretches to improve flexibility are best performed after your muscles are thoroughly warm – at the end of your exercise session. They should be done gently and slowly, without bouncing, and developed by moving deeper into the stretch. They should be held for a little longer than in the warm-up. If you have a diagnosis of osteoporosis, and especially if you have had compression fractures of the spine, avoid stretches that curve your spine or cause you to bend at the waist (forward flexion), for example touching your toes. These positions may put excessive stress on the bones in your spine (vertebrae), placing you at greater risk of a compression fracture of the spine. See page 34 for more information about this.

The following stretches are useful after all types of exercise and physical activity, including weight-bearing exercise and weight training. Hold each of the three stretches for a slow count of ten or more (eight to ten seconds) in the cool-down. Repeat each stretch for the other leg.

Use the back of a chair or a wall for balance, stand tall and take one foot up behind you towards your buttocks. Use a hand to bring it as far as it will comfortably go. Hold your sock or trouser leg if you can't reach your foot. You should feel a stretch down the front of your thigh.



Step forwards with one foot. Let the front leg bend at the knee and hip so that you sink down and forwards a little. Keep the other foot flat on the floor and pointing forwards. You should feel a stretch down the calf of the back leg. Use a chair or wall for balance if you need it.



Keep your feet in the same position as for the previous exercise. Move your weight back by letting the back knee and hip bend and straightening the front leg. Putting your hands on the knee of the bent leg, lean forwards from the hip with a straight back. This should stretch the back of the thigh of the straight leg. If it doesn't, lift your front toe up, leaving the heel on the ground. Use a chair or wall for balance if you need it.

Guide to the exercises

The following information has been divided into two sections.

Section 1

For people wishing to influence their bone strength through exercise and reduce the risk of fractures (broken bones).

This section has been divided into three parts:

Part 1

Exercises for people who

- Are at low risk of fracture
- Wish to use exercise to maintain or strengthen bone
- Want to reduce the risk of future fractures

Part 2

Information and exercises for people who

- Are at higher risk of fracture and may have broken bones easily in the past
- Want safe and effective exercises to keep fit
- Want to reduce the risk of broken bones occurring again in the future

Part 3

Exercises that have been shown to improve stability and balance and thus reduce the risk of falls, which can cause broken bones in older, frailer people

How do I know whether my risk of breaking a bone is high or low and which section is appropriate for me?

- If you are fit and healthy and wish to use exercise to maintain bone strength and prevent problems in the future, then Part 1 is for you.
- If you have been told you have fragile bones (you may have had osteoporosis or osteopenia diagnosed on a bone density scan) and you have broken bones easily in the past, the exercises described in Part 2 will be more appropriate for you.
- If you have had a diagnosis of osteopenia or osteoporosis on a bone density scan but are otherwise fit and healthy and have never broken bones easily, the situation is less clear. A diagnosis of osteopenia or osteoporosis does not necessarily mean that your risk of fractures is increased to the extent

that you should moderate your exercise levels unduly. Bone density (DXA) scan results are considered alongside other factors such as your history of fracture and especially your age to accurately assess your risk of breaking a bone in the near future. Despite your lower than average bone density score, your risk of breaking a bone easily may still be relatively low, in which case the exercises described in Part 1 may be the most appropriate. However, if your bones are likely to be fragile and your risk of fracture is high, then Part 2 will be appropriate for you.

If you are still unsure which group you fall into, please consult your doctor, or speak to one of our nurses on our helpline on 0845 450 0230.

Section 2

Information and exercises for people who have broken bones in their spine as a result of osteoporosis and want to use exercise to help with pain, discomfort and other consequences of broken bones.

Choose the section that applies to you.
However, you may wish to read the entire booklet as some aspects may be useful to you.
If you are short of time or energy, do not feel you have to complete all the exercises. Focus on those that will be particularly beneficial to you, but don't forget to warm up before you start and stretch when you have finished.



Section 1

Part 1

Exercises for improving fitness and bone health – for people at low risk of fracture

This section is designed to provide people whose risk of fracture is low with information regarding safe and effective forms of exercise. It is impossible to provide individual advice regarding appropriate exercise but it is hoped that the following information will provide a good starting point.

Exercise can play an important role in helping to keep bones strong and reducing the risk of bones breaking easily in the future. If you are a fit, healthy adult, then this section is for you. Almost all the evidence on which these recommendations rely has been collected in women. However, the small amount of information we have suggests that they do apply to men as well.

At what age does exercise have the most impact on bone?

Very young bones are the most sensitive to loading. In fact, in girls, the bone accumulated between the ages of 11 and 13 approximately equals the amount lost during the 30 years following menopause. For example, gymnasts aged 10 have much stronger bones than inactive youngsters of the same age and size, and studies suggest that this benefit continues into later life.

Adults are considered to have reached their greatest bone mass around the age of 30, but studies have shown that there is still room for improvement at 30 and above. The vital impact of exercise on bone in mid-life is clearly demonstrated by work with astronauts who have spent long periods of time in weightless environments, who were found to have experienced considerable loss of bone. This work has been replicated using volunteers who remained bed-ridden for weeks or even months to help scientists to separate out the effects of gravity and exercise on bone. Extensive training was necessary to restore not only muscle mass but also bone density and bone strength in these volunteers.



High-impact weight-bearing activities such as jogging or jumping are effective in young adults. Once past middle age, weight-training or classes that contain a variety of activities have been found to influence bone strength.

If you have been diagnosed with osteopenia or osteoporosis and especially if your doctor has told you that you need to take an osteoporosis drug treatment, you may worry about exercising and even reduce your activity levels in the fear that exercise may increase your risk of breaking bones. Although such concerns are understandable, they are for the most part unfounded. In fact, regular appropriate exercise can help to reduce the risk of broken bones occurring in the future. For many people, exercise in one form or another is a big part of their life and a diagnosis of osteoporosis or fragile bones should not mean that this has to stop.

If you have osteoporosis, exercising means finding the safest, most enjoyable activities for you, given your overall health and risk of fracture. There's no one-size-fits-all prescription.

The bottom line is that you can adopt a more active lifestyle at any age, provided you begin with what you know to be safe and progress at an appropriate pace for your age and ability.

Mixed weight-bearing exercise classes

The mixed bag of activities that are provided by the average exercise-to-music or aerobics class have proved successful for improving bone density. These classes can provide a variety of bone-loading exercises. They usually include weight-bearing movement in different directions and should include bouts of high-impact weight-bearing activity. The weight-bearing exercise routines are likely to improve balance and co-ordination; other exercises will maintain flexibility; and floor and wall work that involves useful arm-loading (for example, the press-ups and arm presses) improves bone density in the forearm.

Choose a class led by a qualified exercise professional who is registered with a recognised organisation such as the Register of Exercise Professionals (REPs) or the British Association of Sports and Exercise Sciences (BASES). The instructor should ask you questions about your health and exercise experience prior to you taking part.

Home based arm loading exercises

The following exercises increase bone mineral density in the wrist and load the forearm in various directions. They should be done three times a week and repeated 10–15 times on each occasion. Keep breathing easily and try not to hold your breath while doing these exercises.

Arm press

Stand facing a wall, about 50cm away from it, with your feet slightly apart, arms bent at the elbows and hands at shoulder height.

- Lean your body forwards towards the wall by bending your elbows in a controlled movement.
- Push your body back to the starting position.



Wrist curl



This is an easy exercise that will work your forearm muscles. You can do it with a light weight or water bottle, and progress further by increasing the weight – (the safe limit is 5kg (11lbs) in each hand).

- Sit towards the front of a chair with your feet hip-width apart and your knees over your ankles. Sit with your forearms resting on your thighs, holding a dumbbell in an underhand grip with your palms facing up.
- Position your wrists so that they are just beyond your knees.
- Start with your wrists flat, dumbbells resting on your fingers.
- In one movement, curl your fingers up, followed by your wrists.
- Hold for two seconds then slowly lower back down.
- Repeat 10 times.

Turn your forearm over and repeat using an overhand grip.



Tip: Keep your elbows in contact with your thighs, parallel to your wrists. This will make the exercise more effective.

All fours



Support yourself on your hands and knees on the floor, on a firm mat or carpet. Your fingers should point forwards, and you should have right angles at the wrists, shoulders, hips and knees. While doing this, keep your shoulders level, tighten your abdominal muscles and squeeze your buttocks. Making small, controlled movements, walk your hands forwards as far as you can without over-arching your back or moving your knees or feet. Hold, then walk your hands back to the start position. Rest, then repeat.



High-resistance weight training at the gym

If you belong to a gym or are considering joining one, high-resistance, progressive weight training with resistance machines or free weights has been shown to have a positive impact on bone. This consists of using weights in a slow, controlled manner and needs to be done, at least initially, in a gym with the advice of an instructor. Weight training will make you stronger and increase your bone density if you train three times a week on non-consecutive days. Most gyms run introductory sessions and provide some basic advice about safe lifting techniques and which machines to use. You could show the instructor this booklet.

Choose your exercises so that your legs and arms work alternately. Begin with weights that are 50 per cent of the maximum you are able to lift and aim to perform 12–15 repetitions. Then, as you get used to the movements, gradually increase the weight to 85 per cent over the first three months. As you improve in strength and increase the weights, so that they are still about 85 per cent of your maximum but perform less of them, aiming for 8–10 repetitions. Lift the weights slowly and take a short rest between each lift. Breathe in as you lift and out as you lower the weight. Rest for two minutes between each set. This kind of weight training does not cause bulging muscles, even for women; it enhances muscle tone.



Weight training for women

The weight training programme outlined below, which you can do in the gym, has been shown to increase bone density in women after the menopause, but it should also be useful for younger women. Each lift trains a particular group of muscles; the lift should be performed 24 times in three sets of eight on each training day. This will take 20 to 30 minutes. Do a warm-up with some short, mild stretches before you begin and repeat the stretches slowly and for longer at the end of the session. The weights lifted should be the most that you can lift eight times with “acceptable form”—that is, smoothly through the full range of the movement with no shaking or wobbling (this is about 85% of maximum). Some of the lifts can be done with free weights. Lifts using the movements marked with an asterisk (*) are especially useful for increasing bone density of the hip.

Explain to the exercise professional that you would like a programme that includes the lifts listed below.

Lower body

- Seated leg press
- Hip extension*
- Hip flexion
- Hip adduction*
- Hip abduction

Upper body

- Wrist curl
- Reverse wrist curl
- Wrist pronation/supination
- Bicep curl
- Tricep press

Weight training for men

Exercise to improve muscle strength and balance may help to reduce the risk of fracture even in older men. These lifts should be performed 15 times on each training day, and one set of upper-body exercises should alternate with two sets of lower-body exercises. Start each session with a low-intensity warm-up on a stationary exercise bike. The weights lifted should be 85% of the maximum that you can lift once with “acceptable form”—that is, smoothly through the full range of the movement with no shaking or wobbling.

Explain to the exercise professional that you would like a programme that includes the lifts listed below.

Lower body

- Seated leg press
- Leg curl
- Hip adduction*
- Hip abduction
- Leg extension

Upper body

- Seated chest press
- Seated tricep extension
- Seated dumbbell concentration curls

Trunk

- Trunk extension (lower back)
- Modified sit-up (lie on your back with your feet on the floor and your fingertips behind your ears; look straight up at the ceiling and lift your head and shoulders off the floor).

High impact exercise



These exercises may not be suitable if you are new to exercise or have not exercised for some time. Avoid them if you have osteoarthritis in weight-bearing joints and/or have back, knee or hip pain. If you have been told your bone density is low, you should have a discussion with your doctor about how fragile your bones are before commencing this type of exercise.

Jumping

- Jumping may help to improve bone strength in the hip but has not been proven to increase bone density in post-menopausal women.
- Jumps should be done with both feet leaving the ground together.
- Land softly, letting your ankles, knees and hips “give” or bend slightly as you make contact with the floor.
- Use an arm swing with both arms to help give you lift-off.
- If you have never done this or haven’t done it for a long time, do only three to five small, low jumps for the first few sessions. Build up gradually by adding five jumps at a time. Progress until you can do 50 in total. Take a brief rest between each group of 10 and pause briefly between each jump.
- Build up to 50 jumps a day that lift you about three inches off the floor.
- Skipping for a few minutes daily is also a good impact exercise that will benefit your bones. Ropeless skipping may be a more comfortable alternative.



Jogging

- Jogging may help to improve bone strength in the spine and hip.
- A 20-minute jog three times a week is good exercise for reducing the risk of many disorders, especially if it is on grass or paths rather than tarmac or concrete.
- Intermittent jogging is a great exercise for people who find continuous jogging too strenuous, and involves alternating jogging and walking every 20 metres or so. A combination of stair climbing and intermittent jogging is good for improving bone density in the spine and hip in older women.
- Ensure you have appropriate footwear if you start jogging. Many suppliers have different shoes for different foot mechanics (i.e., pronators or supinators) to ensure that all joints are strained equally.



Other weight-bearing activities

These activities have not been formally evaluated but are likely to influence bone if they provide high-impact weight-bearing exercise. They are suitable for young people and active older people. They include team sports such as netball, basketball, football and hockey; racket sports such as squash, tennis and badminton; and dancing that requires some impact, such as line, tap or Irish dancing. Interestingly, a small study conducted in Glasgow in 2008 showed that some steps used in Scottish country dancing generate considerable force through the skeleton, leading the authors to conclude that it may well have a positive effect on bone strength.

Fit but fragile

Surprisingly, there can be situations in which too much exercise can be bad for the skeleton and actually increase the risk of broken bones. Fragile bones can occur in women who exercise to extreme, such as elite athletes and dancers (it can also be associated with certain eating disorders). There are several factors that combine to cause fragile bones in these women. These include low oestrogen levels, inadequate calorie intake (causing periods to stop) and poor nutrition. If you feel you are exercising too much and that this situation may apply to you, seek help from your doctor.

Part 2

Exercises for people at high risk of fracture and who may have broken bones already

This section is designed to provide people whose risk of fracture is high with information about safe and effective forms of exercise that they may like to consider. It is impossible to provide individual advice about appropriate exercise but it is hoped that the information below will provide a good starting point.

If you are looking for exercise to help with pain and other consequences of vertebral compression fractures, you may find Section 2 more appropriate.

Remaining active is particularly important in those people who have broken bones as a result of osteoporosis.

Suitable physical activity has been shown to:

- Decrease the risk of falls and further fractures
- Improve posture
- Improve balance
- Improve wellbeing
- Improve muscle strength and stamina
- Reduce pain

Physical activity and exercise can turn back the clock on some of the losses caused by age and disease, so it is important to maintain activity levels whatever your age and whatever your health problems.

Younger people who break bones easily

Most fragility fractures affect older people, so many of the suggestions in this section will be more relevant as you move into later life. However, younger people who are affected will find some of the ideas helpful. Very rare conditions such as osteoporosis in pregnancy can result in broken bones occurring easily earlier in life and people who are affected will have specific questions regarding what exercise they should and shouldn't be doing. Because of the highly specific and individualised nature of these cases, it is very important that you seek advice from your doctor and if possible see a physiotherapist, who may be able to provide a customised exercise programme for you or advise you on safety.

For more information please see our leaflet *Osteoporosis in Pregnancy*.

Very occasionally, osteoporosis can affect children and the fractures they sustain may have an impact on their ability to exercise. Such children often have a physical or chronic medical condition that predisposes them to fragile bones. Getting the balance right between reducing fracture risk and not being overly restrictive can be a challenge. The child's specialist nurse or physiotherapist can help to advise the school on how best to include



the child in as many PE- based or physical activities as possible. Appropriate activities may include swimming (and hydrotherapy) and water-based exercise, balance games/ exercises, dance movement classes, wheelchair-based activities or horse riding (with, for example, the Riding for the Disabled Association*). Additionally, for the more severely disabled child, the use of specialised equipment such as swivel walkers or standing frames will help to promote awareness of an upright posture and allow weight bearing through the lower limbs.

**For more information please see our leaflet
*Osteoporosis in Children.***

Adults may be concerned about their employment prospects, especially if their job involves manual work or heavy lifting. Talking to your employer or occupational health professional is an important step and the organisation Backcare* provides useful information on this subject.

*** For contact details please see
pages 57–58.**



Choosing the right form of exercise

It is very important to think about what kinds of activities you enjoy. If you choose an exercise you enjoy, you're more likely to stick with it over time.

These types of activities are often recommended for people at high risk of fracture:

- Strength-training exercises (exercises using body weight as resistance), especially for the back.
- Weight-bearing aerobic activities such as those listed on page 39.
- Flexibility exercises.
- Stability and balance exercises to reduce the risk of falling.
- Aerobic training with controlled movements.

Exercises to avoid

Some forms of exercise may increase your risk of breaking a bone and may not be suitable for people already at high risk of fracture.

Avoid: High-impact, fast - moving exercises such as jumping, running, jogging or skipping.

These activities increase compression in your spine and lower extremities and can lead to fractures in weakened bones. Avoid jerky, rapid movements in general. Choose low-impact exercises with controlled movements such as side-stepping, knee lifting and so on.

Avoid: Exercises in which you bend forwards and twist your waist, such as touching your toes or doing sit-ups.

These movements put pressure on the bones in your spine, increasing your risk of further compression fractures.



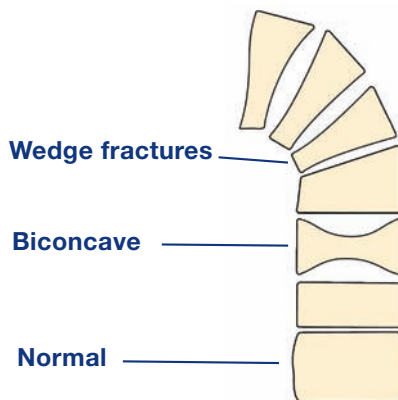
What is a compression fracture?

Fractures caused by osteoporosis of the bones in the spine (vertebrae) usually occur in the lumbar (lower) or thoracic (middle) areas of the spine. They are often referred to as spinal or vertebral fractures. The bones become squashed or compressed because of their reduced strength.

Sometimes they are referred to as “crushed”, “collapsed” or “wedged” depending on how the bone is affected. “Compression fracture” is a good way of describing what happens.

If fractures are numerous and severe, they can lead to significant height loss and curvature, causing shortness of breath, protruding stomach, indigestion problems and stress incontinence. This is because of a reduction in the available space for the internal organs.

Types of compression fracture



Other activities that may require you to bend or twist forcefully at the waist are golf, tennis, bowling and some yoga poses. If you enjoy this type of activity and it is a large part of your life, you may like to adapt the poses and your technique to avoid forward flexion rather than giving it up entirely. An exercise professional may be able to assist with this.

What about sports such as horse riding and skiing?

There is obviously an increased risk of falling associated with this type of activity, and if you have fragile bones they may be more likely to break. If you enjoy this type of activity and it is important to you, its benefits must be weighed up against the possible risk of fracture in the event of a fall. It is impossible to be more specific, unfortunately, and whether or not to continue has to be your decision. Adapting the level and duration of the activity often is sufficient to reduce the risk considerably.

If you are not sure how healthy your bones are, talk to your doctor. Don't let fear of fractures keep you from having fun and being active.

Strength training 2: Exercising using body weight

Exercises that use body weight are effective for strengthening bone because they cause your muscles to generate large forces in the tendons that attach muscle to bone. Bone responds to this extra stress by becoming stronger. Such exercises depend on the resistance caused by the pull of gravity on your bones and this effect may be enhanced by the addition of weights or other simple equipment to increase the resistance.

Upper body

Arm press

Wrist curls

All fours



See pages 20–22 for details of these exercises. Take care not to bend forwards when doing wrist curls. You could place your arms on the chair arms instead of leaning over your knees.

Lying-down exercises for strength (on your front)

These exercises target the muscles that support the spine and enable us to maintain an upright posture. They can be done in bed if you do not find it possible to lie on the floor.

Lie down on your front with your hands folded under your forehead. If you experience any discomfort in your lower back when doing these exercises, place a rolled towel under your tummy and hips.

Back, neck and head lifts

To begin with, using your hands and arms to push gently into the floor, raise your forehead off your hands by a few inches, keeping the back of your neck long as you do so and keeping your chin in. This will help you to get the feel of the movement.

Progress to putting the arms in the position in the picture shown at the top of the opposite page. The elbows are directly under the shoulders and the palms are in line with the elbows – like a lion! Keeping the back of your neck long, as before, gently press your back, shoulders and neck upwards a few inches towards the ceiling by pushing down on your forearms and hands. Keep your forehead facing down and your pelvic bones, knees and feet in contact with the floor throughout. Hold for a count of five if possible; relax for a count of 10. Build up to two sets of 8–10 repetitions.



Progress to putting your arms at the sides of your body, with your palms facing downwards and resting on the floor. Your forehead should also be facing downwards and resting on the floor, if comfortable. Raise your back, head and shoulders, keeping your hips and legs on the floor. Repeat the exercise as before. Progress by turning the palms and forearms up towards the ceiling, still resting on the floor.



Leg lift

Rest your head comfortably on crossed arms. Keeping your legs straight, tighten your buttock muscles and, keeping the leg as long as you can, raise one leg slowly off the floor, no more than a few inches. Hold then lower it slowly. Keep both hips in contact with the floor throughout. Count five on the way up and five on the way down. Relax completely for a count of 10. Repeat with the other leg. Build up to two sets of 10 repetitions.

If you find this difficult, just make a small effort each time. If you keep trying every day, you will find that you manage a little higher each time and eventually achieve an inch or two, which is enough. This is also an excellent exercise for helping to reduce spinal curvature. You may like to use ankle weights, as shown, to increase the effectiveness of this exercise



Weight-bearing aerobic activities

Weight-bearing aerobic activities involve doing aerobic exercise on your feet, with your bones supporting your weight. Examples include walking, dancing, low-impact aerobics, elliptical (cross) training machines and stair climbing. These types of exercise work directly on the bones in your legs, hips and lower spine to slow bone loss. They can also provide cardiovascular benefits, which boost heart and circulatory system health.

Swimming and water aerobics have many benefits, but they are not generally classed as weight-bearing and don't have the impact on the skeleton required to influence bone strength. However, as part of a varied exercise programme, these activities are very good for other aspects of fitness.

Flexibility exercises (stretches)

Being able to move your joints through their full range of motion helps you to maintain good balance and prevent muscle injury. Increased flexibility also does wonders to help improve your posture. Please see pages 10–13 for examples of stretches.



Staying steady – stability and balance exercises to reduce the risk of falling

Many people with osteoporosis break bones as a result of a fall. It is particularly important, therefore, to do all you can to remain steady on your feet. Research has shown that there are many factors that can influence the risk of falling, but exercise has been shown to be particularly important.

Staying active through regular everyday activities such as walking, stair climbing, dancing and gardening is very important, but specific stability and balance exercises have been shown to help the muscles work together in a way that helps to keep you more stable and less likely to fall. Simple exercises such as standing on one leg or movement-based exercises such as tai chi can improve stability and balance.

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The following exercises, if performed regularly, have been shown to improve balance and reduce the risk of falling. Please remember these can be done anytime and anywhere, even waiting for the bus – as long as you have something sturdy to hold onto if you need it! It is important, however, to progress to doing the exercises unsupported as this will challenge and improve your balance further.

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Tandem stand

- Stand sideways next to a wall and place one hand on it for support if you need it.
- Place one foot directly in front of the other so that the heel of one foot is just touching the toes of the other foot.
- Try to stay as still as possible. Do not move your feet around to maintain balance.
- Hold the tandem stand for 10 seconds. Rest. Repeat five times.



Tandem walk

- Stand up straight, using a wall for support if you need it.
- Keep your abdominal muscles tight and your chin tucked in.
- Place one foot in front of the other so that the heel of the forward foot touches the toes of the rear foot.
- Move forwards as if you were on a tightrope with the heel of one foot touching the toes of the other.
- Tandem walk for about 10 feet.
- Repeat five times.

Flamingo swing

- Stand tall and side-on to your support.
- Bring the leg furthest from the chair forwards and back with control.
- Perform 10 swings.
- Turn and repeat on the other leg.



Exercises that improve the strength of our leg muscles can also help to reduce the risk of falling. Simply rising from a chair (without the use of your hands, if possible) and repeating 10 times can help to strengthen the thigh muscles if done regularly.

Leg press

Another useful exercise for improving leg strength is performed using an exercise resistance band (see page 54 for information about this equipment).



- Sit tall at the front of your chair.
- Place the band under the ball of one foot and grasp it with both hands at knee level.
- Lift your foot off the floor, then pull your hands to your hips.
- Now press your heel away from you until your leg is straight and your heel is just off the floor.
- Hold for a slow count of five, then return to the starting position.
- Repeat 6–8 times on each leg.

If you're concerned that you may fall, or if you've fallen already, talk to your GP about falls prevention services in your area.

This might include a program of exercises that you can do on your own or you may be referred for exercise, where you'll be given exercises that are tailored for you.

There is also evidence that taking part in regular sessions of tai chi can help to reduce the risk of falls. Tai chi is an ancient Chinese martial art that studies have shown can benefit health. Its slow, continuous movements place an emphasis on balance and co-ordination. When practiced to improve health and reduce falls, the slow, gentle movements of tai chi can make it an ideal activity for older people.

Contact Age UK (details on page 57) for more information on staying steady and reducing the risk of falling, or read our *All about osteoporosis* booklet.

Section 2

Exercises to help people living with the consequences of vertebral compression fractures

If you have broken other bones as a result of osteoporosis (for example, hip or wrist), please speak to your doctor or physiotherapist about the type of exercise you should be doing to aid your recovery.

Pain control

For more information about the pain associated with vertebral compression fractures, see our booklet *All About Osteoporosis*.

The pain associated with osteoporosis occurs because of the fractures (broken bones) it causes. If broken bones occur in the spine, they are called vertebral compression fractures and can cause back pain due to irritation of the nerves and muscles around the site of the fracture. It is generally agreed that in the early stages, whilst healing takes place, rest with gentle movement is best. Later, however, it is important to regain mobility in order to prevent further loss of strength in the muscles that support the spine. Specific exercises to increase muscle strength may help to reduce long-term back pain and improve posture.

The “cat”



This exercise can be very effective in helping back pain caused by compression fractures.

- This is done by carefully getting onto your hands and knees, making sure that your shoulders are above your hands and your hips are above your knees, as shown above. If your wrists hurt, you can do this stretch on your knuckles and knees instead.
- Make a “U”: take a deep, cleansing breath. As you let it out, face ahead, relax your lower back and allow your pelvis to move forwards towards the floor. Your back will resemble a letter “U”. Only move as much as is comfortable. Hold for a few seconds and release.
- Arch up: breath in. As you breathe out, gently pull your tummy in and press your back towards the ceiling. Let your head drop so that you’re looking at the floor or mat. Your back will look like that of a surprised cat. Hold for a few seconds and release.

The back, neck and head exercises shown on pages 36–37 can also be helpful in strengthening the muscles that support the spine and improving the pain that can occur as a result of vertebral compression fractures.

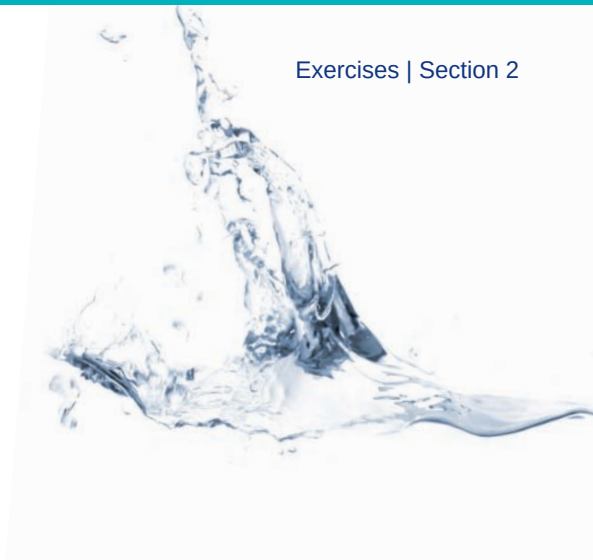
Hydrotherapy

This is exercise therapy in water. Warm water and the support it provides encourage relaxation of tight muscles and joints, which relieves the pain of vertebral compression fractures and increases mobility.

If you are very disabled or have not enjoyed swimming in the past, you will need specialised help with this. Some people, who are severely disabled with vertebral compression fractures associated with osteoporosis have reported that skilled physiotherapists have transformed their lives. Although there has been limited research, back pain appears to have diminished and back strength and posture have seemed to improve.

Unfortunately hydrotherapy is not available everywhere, but, if you are lucky enough to find it, take advantage of it. Make sure your therapist has the qualification “MSCP” (member of the Chartered Society of Physiotherapy).





Water exercises

You could start by moving gently around in the water, then try the exercises described below. Water spas or jacuzzis provide extra warmth and a soothing massage. The slippery poolside is a hazard, so never go alone.

Stand with the water up to your chest. If this makes you feel short of breath, move to shallower water. Do not push exercises to the extent that they are painful. Make sure that your movements are comfortable and this way you will not overdo them.

- Stand with your feet hip width apart and rest your arms on the surface of the water. Then gently turn your body to the right, swinging your left arm in front of you and your right behind you. Keep your elbows straight and in the water throughout. Repeat in the other direction.
- Stand holding on to the side of the pool. Bend one hip and knee up in front of you, standing tall and keeping your back straight. Then stretch your leg out behind you, keeping your knee straight. Repeat with the other leg.
- Try striding in the water (forwards and then sideways).

Postural changes

If you have had several vertebral compression fractures, you may have experienced significant height loss and curvature, which can cause shortness of breath, protruding stomach, indigestion problems and stress incontinence. The back, neck and head lift described on pages 36–37 can help to improve posture and may help with these problems.

It is also essential that you think about your posture throughout the day, as poor posture can easily become second nature, causing or aggravating episodes of back pain and damaging spinal structures.

Bad posture



Good posture

Chin parallel to the floor

Ribs lifted up from the hips

Abdominals tight

Knees soft

Weight distributed evenly



Back of the neck long

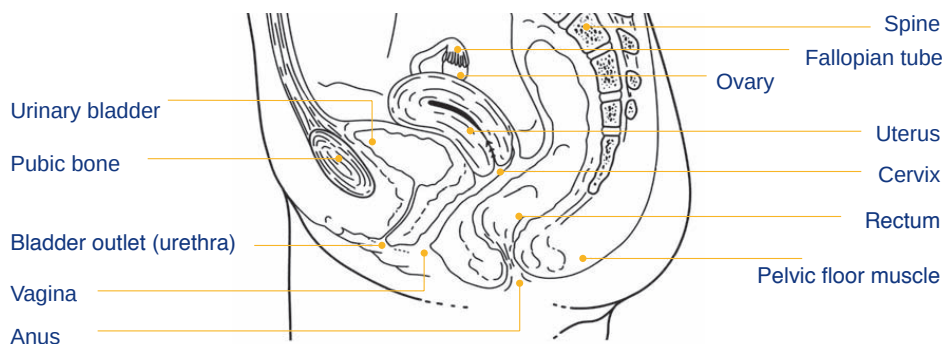
Correct pelvic tilt

Alexander Technique

Extensive coverage has been given to a study that found that the Alexander technique – a method of teaching posture improvement – is beneficial for easing back pain. The study on the technique involved over 500 people with chronic back pain from general practices across the UK. It found that people who received one-to-one instruction in the Alexander technique, along with exercise, had reduced back pain and improved disability after one year compared to those receiving standard care.

See our factsheet *Complementary and Alternative Therapies and Osteoporosis* for more information about the Alexander technique.

Pelvic floor exercises in women



Pelvic floor exercises are one of the first-line treatments for stress urinary incontinence. This problem is caused by weakening of the muscles that run from the front to the back of the pelvis, which help to control the outlets from the bladder and the rectum. These muscles can become weak as a result of childbirth, surgery, immobility or the downward pressure caused by vertebral fractures, and this can cause urine to leak out easily. Understandably, this restricts people from taking exercise. Pelvic floor exercises strengthen these muscles and can help to reduce the embarrassing problems that incontinence can cause.

- Slowly close and draw up the back and front passages in the pelvic floor as strongly as you can, as if you were trying to prevent passing urine or faeces. The feeling is one of “squeeze in and lift up”. Do not pull your tummy in, tighten your buttocks, squeeze your legs together or hold your breath.
- When you have mastered it, hold this contraction for as long as you can, up to a slow count of 10. Rest for a count of four and then contract again, for up to a maximum of 10 repetitions. Count out loud to ensure that you are not holding your breath. Do this every hour throughout the day for improvement if you have a problem, and three times a day for maintenance even if you don't.
- It is also important that these muscles can contract quickly to prevent leakage when you cough or sneeze or get a sudden urge to urinate. So, practise this by doing as many quick contractions of these muscles in a row as you can, up to a maximum of 10.

These exercises are invisible so you can practice them secretly anywhere, anytime. However they are best done after emptying your bladder and not when it is full. It may take three months before you notice the improvement, but persevere because it will be worth it. If you still have problems, your doctor may be able to refer you to a specialised women's health physiotherapist who can advise you further.

Useful information

Things we can all be doing throughout the day

As well as taking time to exercise it is also important to make the most of every opportunity we have throughout the day to maximise our bone health. Walking to the post or shops rather than taking the bus and using the stairs rather than the lift are simple examples of adding to the benefits of the more structured exercises already described. If you have stairs at home or at work, aim for five flights a day, walking up and down stairs (a flight is 10–12 steps).

Think about your posture throughout the day. Poor posture can place a strain on the spine, leading to back pain. See pages 48–49 for tips on improving your posture.

It is vital to take care when lifting. If you have a fragile spine, lifting heavy objects from the floor is a common cause of compression fracture. Avoid lifting from the floor with your arms extended and your back bent or twisted. Always keep your back straight and bend your knees.



Fitness equipment, gadgets and gizmos

Interactive computer-based exercise programmes such as Wii Fit and Xbox Kinect

These are interactive video exercise, games that feature many different exercise programmes including yoga, balance activities, strength training, dance moves and aerobics. Their popularity has grown enormously over the last few years and there has been increasing interest in the possibility of introducing computer - based exercise programmes (such as Wii Fit) more widely into healthcare. One example is using Wii Fit in falls prevention programmes.

Although you would not want to rely solely on video exercise games as a means of exercising to improve bone health (or keeping fit), they are nevertheless a useful resource and may help to motivate some people to exercise more regularly. They can also be used to add variety to an existing exercise programme. Such technology also offers a simple way of keeping active when the weather is bad or during the winter months, when roads and pavements become too slippery for walking or exercising outside.

Walking poles (such as Nordic Walking and Pacer Poles)

These are fitness techniques that use specially designed poles to enhance normal walking. The poles help to propel the walker along by using the power of the upper body. The end result is that the walker works harder than usual and expends more energy, but the support given by the poles makes the actual walking feel easier.

If you are considering taking up this activity, you will need some instruction from a qualified trainer to help you master the correct walking technique; this will also ensure that you get the most benefit from the activity. Additionally, the instructor will be able to advise you about suitable poles, as they need to be exactly the right size for the walker.

There is a lack of research on the value of walking poles for people with osteoporosis, but it is considered to be a low-impact weight-bearing activity and is enjoyed by people of all ages and abilities.

Elastic resistance equipment

There are a number of elastic resistance exercise products available for purchase, including Thera-Band resistance bands. Essentially, these are stretchy pieces of latex that can be used to enhance strengthening and resistance exercises (latex-free versions are available). These bands are particularly useful for exercising the lower leg and arm muscle groups, but there are numerous variations of exercises that can be done with them. Thera-Band (or their equivalent) supplies bands in different strengths—indicated by the colour of the band. They are also available in different lengths and shapes to make specific exercises easier to perform for individuals.

Weighted vests, rucksacks and weighted back supports

Adding extra weight to your own body weight during exercise provides increased resistance and creates an overload effect. This means that your body has to work harder to perform the same action, ultimately improving strength and power.

Wearing a weighted vest during running or walking will certainly increase the weight-bearing effect and there is some evidence to suggest that it may help to reduce bone loss at the hip. However, the potential of the vests to reduce fracture risk has not been sufficiently studied.

Weighted vests are not suitable for everyone and are not recommended for people with spinal curvature or spinal fractures unless used under the direct supervision of a physiotherapist. In addition, increasing the amount of weight being carried can affect a person's balance and may increase the risk of falls in some people as well as putting greater stress on the joints if they already have arthritis.



Trampolining

Exercising on a trampoline (rebounder or trampette) may be useful, especially in individuals at low risk of fracture. It may also improve muscle strength and balance. Although the trampoline may provide a degree of impact exercise, it may also absorb some of the load-bearing effects.

Lack of research means that it is not easy to comment specifically on the benefits or safety of trampolining in relation to bone health for individuals with an increased risk of breaking a bone. Furthermore, the risk of fractures resulting from the jolts to the body whilst trampolining and of awkward falls on, or falling off, the trampoline may outweigh the benefits for individuals with more fragile bones.

The important thing to remember, whatever your health and fitness status and exercise programme, is that little and often, progressing slowly, steadily, comfortably and enjoying your exercise is key. It's never too late to begin to improve your fitness. Be a wise exerciser and seek help and advice if you need it.



Useful resources and contacts

Books

Strong Bones for Life

By Joan Bassey and Susie Dinan

Carroll & Brown Publishers Limited

Organisations

Age UK

Tel. 0800 169 6565

www.ageuk.org.uk

BackCare – the Charity for Healthier Backs

16 Elmtree Road

Teddington

TW11 8ST

Helpline 0845 130 2704

www.backcare.org.uk

EXTEND (provides gentle exercise to music for older people and for anyone of any age with a disability)

2 Place Farm

Wheathampstead

Hertfordshire

AL4 8SB

Tel. 01582 832760

www.extend.org.uk

NHS Choices

www.nhs.uk

The Register of Exercise Professionals (REPs)

(An independent public register which recognises the qualifications and expertise of health enhancing exercise instructors in the UK)

Castleford House
77-91 New Oxford Street
London
WC1A 1DG
Tel. 020 7632 2022
www.exerciseregister.org

Riding for the Disabled

Norfolk House
1a Tournament Court
Edgehill Drive
Warwick
CV34 6LG
Tel. 0845 658 1082
www.riding-for-disabled.org.uk

The Society of Teachers of the Alexander Technique

Grove Business Centre
Unit W48
560-568 High Road
Tottenham
London
N17 9TA
Tel. 0207 482 5135
www.stat.org.uk

Tai Chi Union of Great Britain

c/o 5, Corunna Drive
Horsham
West Sussex
RH13 5HG
www.taichiunion.com

Thanks to Carroll & Brown
for permission to use images.

The National Osteoporosis Society would like to say a special thank you to the expert advisors and charity members for their invaluable experience and enthusiastic support in writing this booklet, particularly Dr Susie Dinan and Dr Dawn Skelton.

Other leaflets in this range:

- Anorexia nervosa and osteoporosis
- Anti-epileptic drugs and osteoporosis
- Breast cancer treatments and osteoporosis
- Clothing, body image and osteoporosis
- Coeliac disease and osteoporosis
- Complementary and alternative therapies and osteoporosis
- Complex regional pain syndrome and osteoporosis
- Drug treatments and osteoporosis
- Glucocorticoids and osteoporosis
- Further Food Facts and bone - beyond calcium and vitamin D
- Healthy living for strong bones
- Hip protectors and osteoporosis
- Hormone therapy in men and women and osteoporosis
- Hyperparathyroid disease and osteoporosis
- Osteoarthritis and osteoporosis
- Osteogenesis imperfecta and osteoporosis
- Osteoporosis in children
- Percutaneous vertebroplasty and balloon kyphoplasty and osteoporosis
- Pregnancy and osteoporosis
- Scans and tests and osteoporosis
- The contraceptive injection (Depo Provera) and osteoporosis
- Thyroid disease and osteoporosis
- Transsexual people and osteoporosis
- Vibration therapy and osteoporosis

 **0845 130 3076 (General Enquiries)**

 **0845 450 0230 (Helpline)**

 **www.nos.org.uk**

 **Camerton, Bath BA2 0PJ**

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President: HRH The Duchess of Cornwall

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