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Exercise

Consumer guide

Exercise and bone density

Regular physical activity and exercise plays an important role in maintaining healthy bones. Exercise is recognised as one of the most effective lifestyle strategies to help make bones as strong as possible, reducing the risk of fractures later in life. As well as improving or maintaining bone density, exercise increases the size, strength and capacity of muscles. Exercise must be regular and ongoing to have a proper benefit.

Exercise is important at different stages of life. In children exercise helps growing bones to become as strong as possible to help minimise the impact of bone loss as we grow older. Exercise also maintains bone health in adulthood, helps to prevent or slow bone loss after menopause and helps to improve balance and co-ordination in the elderly to reduce the risk of falls. Exercise can also help speed rehabilitation following a fracture.

Research studies on exercise and bone health have shown that:

- Children who participate in moderate to high impact weight-bearing exercises, for example, hopping, skipping and jumping, have higher bone density compared to less active children.
- For adults, a combination of progressive resistance training with a variety of moderate impact weight-bearing activities is most effective for increasing bone density or preventing the bone loss that occurs as we age.
- Hip fractures have been found to be as much as 38-45% lower in older adults who have been physically active in their daily life, compared to less active people.
- When 'stress' is not placed on bone, a decline in bone density can result. This can occur after prolonged bed rest or in people who are wheelchair bound and can even impact on astronauts due to the weightlessness of space.

Exercise throughout life

The specific goals of exercising for bone health change throughout life; from building maximum bone strength in childhood and adolescence, optimising muscle and bone strength in young adulthood, to reducing bone loss in old age. For the elderly, the focus is on prevention of sarcopenia (muscle wasting) and addressing risk factors for frailty and falls, particularly difficulties in balance, walking ability and mobility.

Exercise and its effects

Age	Bone status	Exercise effect
Childhood/ Adolescence	In girls and boys the major build up of bone occurs in the pre-teen and adolescent years. Peak bone density is reached during mid to late 20s.	Can increase bone density and structure to maximise peak bone strength, which helps keep bones strong for longer in adulthood.
Early to mid adulthood	Bone density is maintained or starts to decrease very gradually when a person reaches their 30-40s although increases are still possible during middle adulthood.	Can maintain or increase (1-3%) bone density and improve cardiovascular health and fitness; resistance training can also improve muscle mass and strength.
Post menopausal women	In women from the age of 45 years, bone loss begins to increase to 1-2% per year. Bone loss accelerates up to 2-4% per year at the onset of menopause.	Can maintain bone strength by helping to slow the rate of bone loss following menopause. It is very difficult to increase bone density during or after menopause by exercise alone. Can effectively improve muscle function (balance) and reduce falls risk.
Men	Bone density tends to remain relatively stable until middle age, decreasing by about 0.5-1.0% per year from the age of 45-55 years. Low testosterone or hypogonadism can increase bone loss in men.	Can maintain or increase (1-2%) bone density, improve muscle mass, strength, balance and co-ordination to help prevent falls and maintain general health.
Older adults without osteoporosis	After 75 years of age, further increases in bone loss occur in both sexes, especially from the hip. The risk of fracture increases as bone loss increases.	Helps to maintain bone strength and increase muscle strength, balance and co-ordination, which in turn help to prevent falls.
Older adults with osteoporosis/ fractures	Bones are increasingly thin and fragile.	Exercises recommended by physiotherapists and exercise physiologists can improve general health, muscle strength, balance and posture to prevent falls and reduce the risk of further fractures.

The right kind of exercise

Specific types of exercise are important for improving bone strength. Bones become stronger when a certain amount of impact or extra strain is placed on the bones. Exercises recommended for bone health include:

- Weight-bearing aerobic exercise (exercise done while on your feet) – for example, brisk walking, jogging and stair climbing.
- Progressive resistance training (lifting weights that become more challenging over time).
- Moderate to high impact weight -bearing exercise – for example, jumping, skipping, dancing, basketball and tennis.
- Balance and mobility exercise. While not improving bone or muscle strength, these exercises can help to reduce falls – for example, standing on one leg with the eyes closed, heel-to-toe walking.

Regular weight-bearing exercise (including exercise at moderate to high impact), as well as resistance training, is recommended.

Some exercises are better at building bones than others. The ability of an exercise to build bone (its osteogenic capacity) depends on the specific way that stress is applied to the bone during the exercise.

The impact of selected exercises on bone health

Highly osteogenic	Moderately osteogenic	Low osteogenic	Non-osteogenic*
Basketball/Netball	Running/Jogging	Leisure walking	Swimming
Impact aerobics	Brisk/Hill walking	Lawn bowls	Cycling
Dancing/Gymnastics	Resistance training	Yoga/Pilates/Tai Chi	
Tennis	Stair climbing		
Jump rope			

* While certain exercises may have low to no osteogenic benefits, this does not imply that these exercises do not offer a wide range of other health benefits.

Getting the most out of exercise

Exercise must be regular:

- At least 3 times per week.

Exercise should progress over time:

- The amount of weight used, degree of exercise difficulty, height of jumps, etc. must increase or vary over time to challenge the bones and muscles.

Exercise routines should be varied:

- Variety in routines is better than repetition.

Exercise should be performed in short, intensive bursts:

- Regular short bouts of weight-bearing exercise separated by several hours are better than one long session. Lifting weights quickly is more effective for improving muscle function than lifting them slowly. Rapid, short bursts of movement such as jumping or skipping are more effective than slow movements.

If exercise needs to be reduced, it is better to reduce the length of each session rather than the number of sessions per week.

Recommended exercises for different stages of life

Group	Type of exercise
Healthy adults	A variety of weight-bearing activities and progressive resistance training for at least 30 min, 3-5 times per week. AVOID prolonged periods of inactivity.
Post menopausal women and middle aged men	Varied exercise regime – include moderate to high impact weight-bearing exercise and high intensity progressive resistance training, at least 3 times per week. Tip: specific 'spinal extension' resistance training during middle-age has been shown to reduce spinal fractures.
Older adults and people at risk of osteoporosis	Participation in varied and supervised exercise programs is encouraged. These include weight-bearing activities, progressive resistance training and challenging balance and functional activities, at least 3 times per week.
Frail and elderly	A combination of progressive resistance training and balance exercises is recommended to reduce falls and risk factors for frailty (which may include muscle wasting, poor balance, fear of falling).
Osteoporosis*	A combination of weight-bearing exercise with supervised progressive resistance training and challenging balance and mobility exercises, at least 3 times per week. AVOID forward flexion (bending over holding an object, sit ups with straight legs) and twisting of the spine, as this may increase risk of a spinal fracture.
Osteoporosis – after a fracture has occurred	Exercise is an important part of rehabilitation and a program will normally be planned and supervised by a physiotherapist. Exercises will be determined by the type of fracture and the patient's age and level of physical function. Resistance training has been shown to be effective following hip fracture.

* Moderate to high impact activities are only recommended for people with osteoporosis who do not have a previous fracture(s) or lower limb arthritis. Consult your doctor and physiotherapist for advice.

Weight-bearing activities may either be moderate impact (for example, jogging, hill walking), moderate to high impact (for example, jumping, skipping, step ups) and/or various sports that involve moderate to high impact (for example, basketball, tennis).

Resistance training requires muscles to contract when lifting weights, placing stress on the muscle and related bones. The bones strengthen as they adapt to this extra strain. It is best to target specific muscle groups around areas that are most vulnerable to osteoporotic fractures – usually the hip and the spine. It is also wise to strengthen leg muscles to improve balance.

Note: Leisure walking on its own is not recommended as an adequate strategy for bone health, although it has benefits for general health and fitness. Swimming and cycling are also considered low impact sports that are not specifically beneficial for bone health.

Preventing falls

Falls are a common cause of fracture. As people age, their chance of falling increases. Approximately 33% of people over 65 fall each year. For people with osteoporosis, even a minor fall can cause a fracture. Half of all falls occur in the home or the area surrounding the home. It is estimated that up to 6% of falls result in a fracture and that around 90% of hip fractures occur as the result of a fall. Therefore, preventing falls has become an important part of managing bone health.

Falls are most commonly caused by:

- Poor muscle strength.
- Poor vision.
- Problems with balance (due to weak muscles, low blood pressure, inner ear problems, medicines, poor nutrition).
- Home hazards which lead to tripping.

Strategies to avoid falls

Strategy	How it is done
Exercise	Physiotherapists can assist with a falls prevention program and advise on programs run in the community. • Supervised Resistance Training to strengthen muscles (this can also give confidence and reduce the fear of falling). • Balance exercises, for example, heel-to-toe walking, Tai Chi, standing on one leg.
Medical Review	• Doctor to review any conditions or medicines that may be causing poor balance or dizziness. • Doctor may recommend a visit to an optometrist to correct vision and/or a podiatrist for proper footwear.

Around the home	• Occupational therapist can conduct a home audit and suggest important changes to the home environment (and may recommend walking aids if needed).
	• Use a 'home checklist':
	  • Install handrails on steps and in bathrooms (beside toilet, shower, bath).
	  • Non-slip strips on stairs and non-slip mats in bathroom.
	  • Ensure rooms are well lit.
	  • Ensure edges of rugs and mats are flat or remove altogether.
	  • Secure electrical cords and remove loose cords from walkways.
	  • Ensure regularly used items in kitchen are within easy reach.
	  • Maintain outside paths.

Nutrition	• Improving nutrition can assist muscle strength. This includes adequate calcium and vitamin D levels.

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