International
Osteoporosis
Foundation

Invest in your bones

Move it or Lose it

How exercise helps to build and maintain strong bones, prevent falls and fractures, and speed rehabilitation

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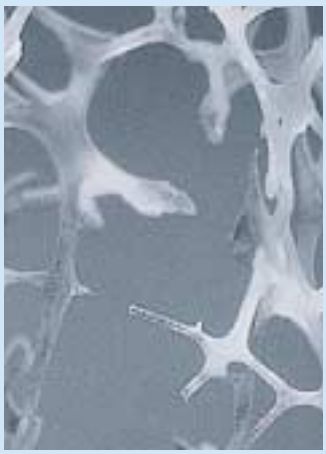
Photograph by Yuyung Abdi

Osteoporosis is a disease in which the density and quality of bone are reduced, leading to weakness of the skeleton and increased risk of fracture, particularly of the spine, wrist, hip, pelvis and upper arm. Osteoporosis and associated fractures are an important cause of mortality and morbidity.

- Osteoporosis, "the silent epidemic", is a global problem.
- Approximately 1.6 million hip fractures occur worldwide each year, by 2050 this number could reach between 4.5 million[1] and 6.3 million[2].
- In women over 45, osteoporosis accounts for more days spent in hospital than many other diseases, including diabetes, myocardial infarction and breast cancer[3].
- It is estimated that only one out of three vertebral fractures come to clinical attention[4].
- Women who develop a vertebral fracture are at substantial risk for additional fracture within the next year[5].

Normal bone



Osteoporotic bone

The IOF 'Invest in your bones' publications are issued on World Osteoporosis Day in support of IOF member activities around the world and are translated into many languages.

2001
Bone development in young people

2002
Osteoporosis in the Workplace

2003
Quality of Life

2004
Osteoporosis in Men

2005
Exercise: Move it or Lose it

Foreword

Bone and movement are inextricably linked. Bones help convert muscle power into directional motion. While a cheetah can run at incredible speeds, species without a skeleton, such as certain kinds of snails or caterpillars, are restricted to a crawl.

But while bones bring enormous advantages, they must also be appropriately sized – there is no point having really large muscles and tiny little bones that could snap in an instant. Luckily, evolution has ensured that as muscles get bigger and more powerful, bones also get heavier and stronger so that they are not overpowered.

This is just as true for humans as it is for tiny insects or huge dinosaurs. As we grow our muscles get bigger and so do our bones. Improving the strength of our muscles will cause a strengthening of our bones. Stronger muscles result in stronger bones. It is that simple.

Unfortunately, osteoporosis is a condition that causes a reduction in bone mass and a deterioration of bone structure. Osteoporosis weakens bones and weak bones can easily fracture. In turn, fractures cause pain and can put severe limitations on our daily life because they reduce mobility[6].

Less mobility, because of an osteoporosis-related fracture or simply taking no exercise, means muscles are not being used as much. This lack of movement results in a cutback in the production of new, healthy bone tissue. Thus, weaker muscles result in weaker bones.

Furthermore, as muscles are used less and less, the control our nervous system exerts over those muscles begins to decline. This means that reflexes are not as good as they should be and the risk of stumbling or falling increases. If we don't exercise our muscles, we run the risk of falling, and this, in turn, increases our risk of having a fracture.

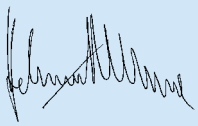
All this justifies the idea that improving muscle strength and muscle function is beneficial for our bones. Exercise builds strong muscles, which in turn builds strong bones. Exercise also improves muscle control, balance and coordination, and reduces the risk of falling or suffering a fracture during a fall.

So, let everyone, people of all ages, mobilize in order to strengthen their muscles.
This will bring considerable benefit for:

- The young – it will help them build strong bones
- Adults – it will help them maintain their bones
- The elderly – it will help prevent bone loss and falls

Even patients who have suffered fractures already can benefit from special exercises and training, which can improve muscle strength and muscle function. This allows mobilization and improves daily life activities.

So, let's mobilize our energy, let's build our bones, let's move!



Helmut W. Minne

Invest in your bones

Move it or Lose it

How exercise helps to build and maintain strong bones, prevent falls and fractures, and speed rehabilitation

Introduction

The bones that make up our skeleton are made from living tissue, which renews itself continuously throughout our life. If our skeleton is to do this effectively and remain strong, it needs regular stimulation from physical activity.

Bone is made of a calcium mineral, which gives bone its hardness and whiteness. This calcium mineral is embedded in a protein mesh of collagen, which is gristly and makes bone slightly flexible. Bone tissue is not completely solid, but has a honeycomb structure inside a thick, solid outer layer. This efficient design maximizes strength, without making the bones too heavy.

The inner honeycomb structure of bone provides a huge surface area which is lined with bone cells. These cells continually renew the bone tissue in a well-ordered cycle of breakdown and rebuilding, called 'bone turnover' (or 'bone remodeling'). This process ensures that new, healthy bone replaces older bone, that any damaged areas are repaired, and that the bone is kept strong. The same process of bone turnover allows bone to gain strength in response to increased load (e.g., exercise) – or conversely to lose strength, if loads are reduced.

So, "move it or lose it" is the title of this exercise report, which is designed and written to increase understanding and awareness of the importance of exercise for maintaining healthy bones and fighting osteoporosis.

Bones should be used regularly or they will deteriorate, just as muscles do if they are not used. Bones need a variety of brief, frequent loads every day (e.g., normal daily activities like walking and climbing stairs) to maintain their strength, and bones need to be loaded a bit more than usual (exercise) to improve their strength. These facts are underlined by the results of recently published clinical studies.

However, there is an urgent need for further studies to improve our understanding of how and, specifically which, forms of exercise may help to maintain bone mass and strength, and thus help prevent fractures. In patients diagnosed with osteoporosis, more studies are needed to establish, scientifically, what types of rehabilitation exercises would be helpful in combination with prescription medicine in order to optimize bone and muscle health, improve quality of life, and reduce the risk of fracture and fracture recurrence. In this way we can best overcome the burden of osteoporosis and its life-threatening consequences.

Illustration by Anuschka Dupalo-Loss

Exercise Builds and Maintains Bones

Bone is a living tissue! Don't be fooled by the 65 million-year-old dinosaur bones seen in books, museums, or on the TV. There is nothing permanent about living bone. Like a muscle, it can grow and it can shrink. It is in a constant state of change.

Unfortunately, the biggest change comes with age. As people get older their bones begin to deteriorate. Even as early as age 40, bones are no longer as strong as they once were. They have begun to get thinner – and weaker. Unchecked, this deterioration can be a contributing factor in developing osteoporosis, which in turn increases the risk of having a fracture.

One of the best ways to build and maintain healthy bones is through exercise.

So far, it is known that around the world, osteoporosis affects one in three women and one in five men over age 50[7-9]. Despite this, steps to prevent gradual loss of bone, particularly lifestyle changes, are not widely taken because people are not aware of what they can do to keep their bones healthy and strong. But, there are actions that everyone can take to reduce the risk of osteoporosis.

Over the last two decades or so, healthcare professionals have come to realize that one of the best ways to build and maintain healthy bones is through exercise. Just like muscles, bones respond when they are "stressed," in other words, when they are forced to bear more weight than they are used to. This can be achieved by "weight bearing" or impact exercises such as walking, running, lifting weights, jumping, or dancing. Low impact or "non-weight bearing" exercises, such as cycling or swimming will not have the same 'loading' effect on bones, but are nevertheless excellent for overall health, and improve muscle strength.

Physical education at school becomes especially important as children spend more time in front of the television and computer.

A regular, well structured exercise regimen can help protect against osteoporosis, osteoporosis-related fractures, and, can help in rehabilitation. This is true for everyone, not just those over 40. Here's why.

Exercise Builds Bone in Children

How long a house will last depends on how strong the foundation is. Likewise, how long bones stay healthy depends on how well they were made to begin with.

Most people reach their "peak bone mass" in their 20s. This is when bones have achieved their maximal density and strength. After peak bone mass is reached, bone density remains stable during adulthood, then begins to decline. Physicians once thought that reaching this peak depended primarily on diet, including sufficient calcium intake, and exposure to sunlight, which is necessary for production of vitamin D in the skin – vitamin D is necessary for the absorption of calcium from food, for the healthy functioning of bone tissue, and thus for maintaining bone strength.

But recent studies have shown that in laying down the bone foundation that will serve for a lifetime, exercise is just as important as diet. This is true throughout childhood and adolescence, but especially important around the growth spurt at puberty[10].

In Finland, for example, Marjo Lehtonen-Veromaa and colleagues have shown that the most physically active young girls gain about 40% more bone mass than the least active girls of the same age[11]. This extra bone contributes to peak bone mass, and should give these more active girls an advantage in later life.

In girls, the bone tissue accumulated during the ages of 11 to 13 approximately equals the amount lost during the 30 years following menopause.[12]

Ego Seeman from Australia, and other colleagues from Europe, have studied female gymnasts, both young girls and middle-aged women, and found that not only are prepubertal gymnasts likely to have a much better bone mineral density, but that later in life, women who had trained as gymnasts also had much denser bones than non-gymnasts[13]. In another study, boys who did the most vigorous daily activity had nine percent more bone area and 12 percent more bone strength than less active boys[14].

The moral of the story: it is never too early (or indeed too late, as we shall see) to begin the process of making your bones as strong as possible.

Exercise Maintains Bone in Adults

So, exercise can help to build bones in youth – and it can also help to maintain them in adults. The most dramatic example of this comes from an unearthly source, space. When cosmonauts and astronauts first traveled beyond the Earth's atmosphere, doctors back home eagerly awaited their return to see how zero gravity had affected them. The first and most obvious impact was that their muscles had wasted away. It was realized soon after, that so too had their bones[15].

In zero gravity, muscles do not need to work as hard to help you sit up, stand, or lift something. The body responds to this by keeping only the muscles that are essential – what happens to astronauts is akin to what happens in retired weight lifters, the muscle tissue that is not needed anymore fades away, and with it so can bone.

Exercise and bone maintenance are inextricably linked.

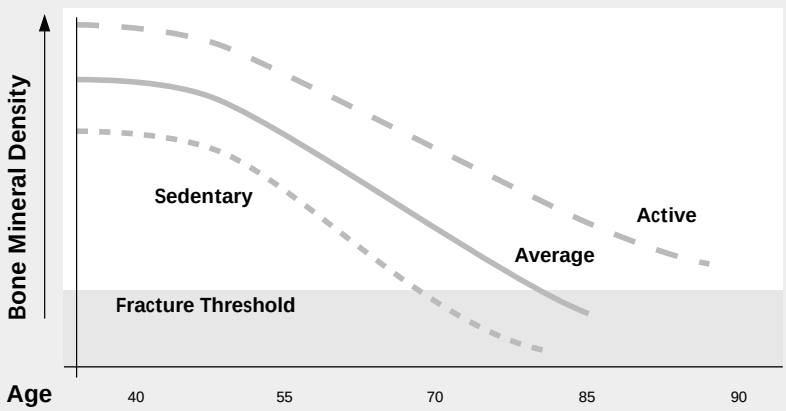
Now, we have a much better understanding of the relationship between bone density and muscle mass. We know that we cannot depend on gravity alone to provide the mechanical stimulation that builds bone and prevents bone from wasting away – exercise also plays a key role.

Perhaps nowhere is this more obvious than in terrestrial astronauts – those who have spent long periods of time lying in bed. As part of a study to investigate the effects of long-term space travel, Free University of Berlin's Dieter Felsenberg and colleagues, including those at the European Space Agency, have studied what happens to healthy, young volunteers who are prevented from using their muscles for extended periods.

"Terranauts", volunteers who remain bed-ridden for weeks, or even months, are helping scientists separate the effect of gravity and exercise on bone. The three images show a young volunteer before and after 3 months (middle photo) of bed rest. Excessive training is necessary to restore not only muscle mass, but also bone density and bone strength, whereby the latter cannot be restored completely (right picture).

These "terranauts" spent months lying flat, not doing any exercise. When they finally got out of bed, they were faced with a myriad of difficulties: Weak muscles, legs that could not jump, and the loss of bone. Up to 15% of their bone mineral density was lost in as little as a three month "space flight," according to Felsenberg.

Such studies demonstrate that exercise and bone maintenance are inextricably linked.



Bone changes over time
This graph shows how bone mineral density (BMD) falls with age. The middle line shows the BMD of an average woman over time, and the outer lines show the BMD of an active and sedentary woman, respectively. When BMD falls below the fracture threshold (when fracture becomes likely) a diagnosis of osteoporosis is made. The graph shows that this tends to happen at a much earlier age in sedentary woman than in active woman.

Exercise Maintains Bone in the Elderly

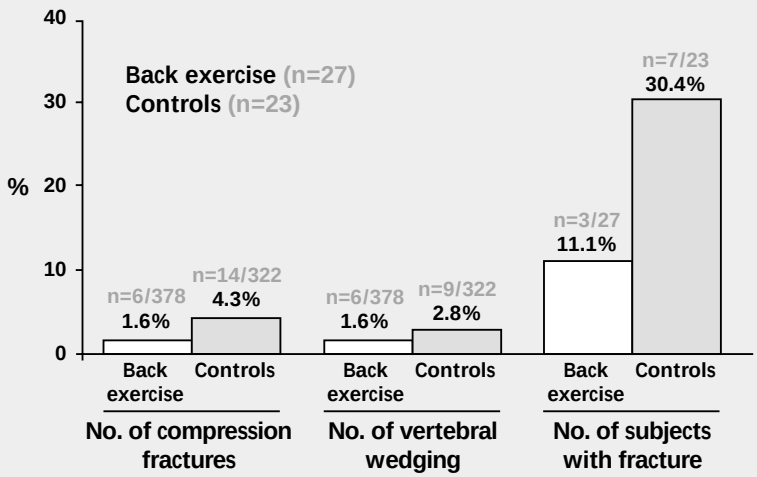
Exercise can help us all, not just young, fit terranauts. Mehrsheed Sinaki, and colleagues in the USA and Japan, found that when older, postmenopausal women used small weights to strengthen their back muscles over a period of about two years, ten years down the road, they had stronger back muscles than their peers who did not exercise. Their bones were stronger too, particularly their vertebrae.

But what is probably even more important, these back strengthening exercises reduced the chance of getting a fracture by almost three-fold[16].

In these women, aged from 58 to 75, only about 11% of those who exercised were found to have at least one vertebral fracture, while just over 30% had suffered a fracture in the group that had not used the exercise regimen. Women who had not taken part in the back exercise program were also about twice as likely to have a compression fracture in the spine, or have "wedged" vertebrae. This is a condition where a vertebra, normally rectangular in shape, is compressed at one side, making it look like a wedge. Wedging, which can be very painful, may lead to kyphosis, or curvature of the spine, if sufficient numbers of vertebrae are affected.

Wedged vertebrae, seen circled in image right, but absent in the left image taken from the same patient two years prior, can be a major source of pain and immobility in elderly patients with osteoporosis (image from ref.17).

Postmenopausal women, who took part in a two-year back exercise regiment, were half as likely to have wedged vertebrae as control patients.



Back stengthening exercise reduces vertebral fracture risk
This graph demonstrates the effect of back muscle strengthening on the rate of vertebral compression fractures and vertebral wedging in postmenopausal women. Ten years after a 2-year back exercise program, the proportion of women with fractures was only 11% in the exercise group as compared to 30% in the control group. Both wedging and vertebral compression fractures were significantly less in the back exercise group than the control group several years after the exercises were discontinued. (Modified from Ref.18, with permission)

Exercising your back during middle-age can help prevent your vertebrae from weakening or fracturing when you get older.

Exercise Helps Posture and Balance – Prevents Falls

Though a person with osteoporosis has a much greater risk of suffering a bone fracture than someone with normal bone mineral density, studies have shown that it is often a fall that causes the fracture. This puts elderly people at even greater risk of fracturing a bone because they tend to fall more often. In fact, every year about two out of five (40%) people over 65 fall at least once. So, avoiding falls could go a long way towards preventing fractures, particularly hip fractures, most of which are the direct result of a fall.

Every year, about two out of five people over 65 will fall at least once.

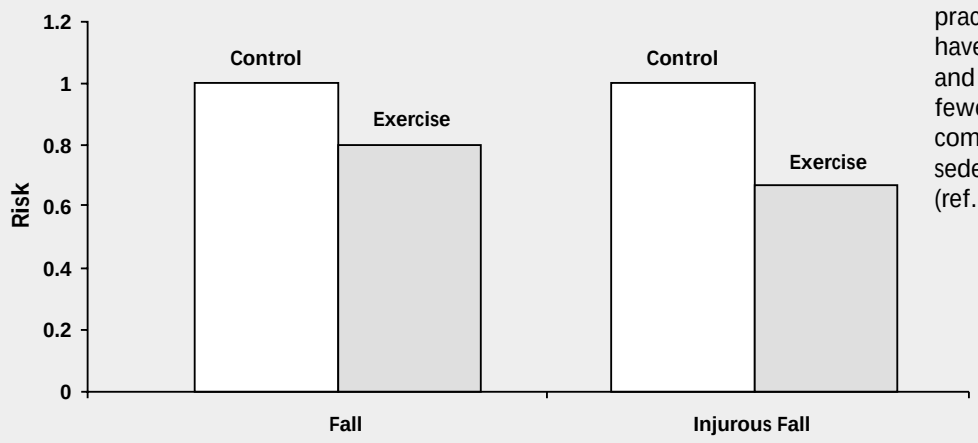
So how can falls be prevented? Following treatment for an injurious fall, older people should be offered multidisciplinary assessment to identify and address future risk, and individualized intervention aimed at promoting independence and improving physical and psychological function. In addition to an assessment of home hazards, visual impairment and medication, it is essential that strength and balance training are offered[19].

Numerous studies have shown that people with better posture, better balance, and greater muscle power are much less likely to fall and are therefore less likely to be injured. On the other hand, those with a more sedentary lifestyle are more likely to have a hip fracture than those who are more active. For example, women who sit for more than nine hours a day are 50% more likely to

photos by Kerstin Zillmer

Individually tailored exercise programs include balance training to reduce the likelihood of having a fall.

Effect of Tailored Exercise on Falls in the Elderly



This graph demonstrates that people over 80 who practice regular exercise have 20% fewer falls and approximately 35% fewer injurious falls in comparison to their sedentary counterparts (ref.20).

have a hip fracture than those who sit for less than six hours a day[21].

Because of these findings, many research groups have been investigating the benefits of exercise in the elderly as a means to improve their coordination, strength and balance.

Women who sit for more than 9 hours a day are more likely to have a hip fracture.

When data is pooled from these studies it shows that in women over 80 years old, an individually tailored exercise regimen that incorporates progressive muscle strengthening, training for balance, and a walking plan, can reduce the overall risk of falling by about 20%, and cut serious injury-sustaining falls by just over 30%[21].

Individually tailored exercise programs are proven to reduce falls and fall-related injuries.

The balance aspect of this training may be key. A study has shown, for example, that patients practicing Tai Chi, an ancient Chinese martial art that focuses on balance, fall only half as much as their peers. This significant improvement was achieved after only 15 weeks, during which the patients received one Tai Chi lesson per week with an instructor and were asked to practice twice daily for 15 minutes on their own.

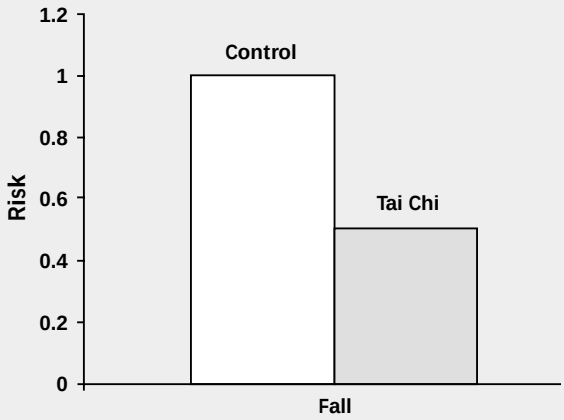
Exercise can help to prevent further fractures, relieve pain and help maintain quality of life.

photo by Kerstin Zillmer

This image depicts one type of muscle strengthening exercise used in tailored exercise programs

Tai Chi is an ancient Chinese martial art consisting of a series of slow, gentle, continuous movements. It is particularly suitable for older people as it helps them to develop stronger muscles and better balance and concentration.

Effect of Tai Chi on Falls in the Elderly



Patients who perform Tai Chi twice daily have an impressive further risk reduction of almost 50% (ref.20).

Exercise Aids Rehabilitation

By helping to build and maintain bone and by improving balance and posture, exercise can play a major role in preventing osteoporosis and fractures.

But exercise can also play a crucial role in rehabilitation. Remember, muscle strength and bone strength are related. Muscle strengthening exercises can help to rebuild bone in those who have developed osteoporosis, and it can also provide relief from one of the most debilitating symptoms of osteoporosis: pain.

photo by Dr. Geoff Higgs

This photo, which shows three generations of South Korean women, clearly illustrates the progressive effects of osteoporotic vertebral fractures.

Exercise and Vertebral Fractures

Chronic pain is perhaps most problematic in people with kyphosis, or curvature of the spine. This is a consequence of osteoporosis that is very often seen in older women and is commonly attributed to "just another symptom of ageing." In fact, kyphosis is almost always due to osteoporotic fractures of the vertebrae, particularly in the region of the upper back.

When vertebrae become weakened, they can no longer support the weight of the body and they begin to get compressed. This compression, typically at the front edge of the vertebrae, leads to forward curvature of the spine, commonly recognized as a "hunchback".

Kyphosis causes loss of height, poor posture, and a shift in the center of gravity. Because of these changes, people with kyphosis have a greater risk of falling and possibly having a fracture.

In the worst cases, the curvature of the spine is so severe that the rib cage is pressed down against the pelvis. This most often happens when vertebral fractures lead to an additional loss of height. Forced into this posture, patients can suffer chronic, severe pain, and can also have trouble breathing. Patients with kyphosis find it difficult to cope with daily life and are prone to suffering from depression.

Exercise can help relieve the pain and some of the symptoms of kyphosis. By strengthening the muscles in the back, the spine can be brought more upright. This has been shown to increase mobility and reduce pain[22]. This type of therapy can greatly improve the quality of life of the patient.

Exercise can also be an important part of a treatment regimen designed to prevent future fractures. Patients with kyphosis often suffer from multiple vertebral fractures over time. It has been shown that the "time since last fracture" is a major determinant of the quality of life of these patients[23].

Exercise can help relieve the pain and some of the symptoms of kyphosis.

Illustration by Anuschka Dupalo-Loss

Exercise Can Aid Recovery from Hip Fractures

Hip fractures may be the most serious complication that can arise from osteoporosis.

In addition to the incapacitation, mortality rates in those who have suffered a hip fracture are up to 20% higher than in subjects of the same age and sex.

More than 95% of patients require surgery to repair their hip fracture, and of these, fewer than one-third will regain normal functioning, and a further one-third have to give up independent living and need constant care. This puts considerable burden on patients, family members and health care systems.

Fewer than one out of three patients who have surgery to repair a hip fracture will regain normal function.

Recent studies have shown that intensive exercise training can lead to improvements in strength and function in elderly patients who have had hip replacement surgery[24].

Patients who received the exercise therapy were significantly better at a variety of daily living fundamentals, such as getting up, walking, climbing stairs and maintaining posture. For example, they walked on average 50% faster and climbed stairs about 30% faster than patients who did not receive the exercise regimen.

Emotionally, patients who had received the exercise therapy were less distressed by their overall condition than patients who did not, although both groups of patients were equally as fearful of falling[24].

photo by Kerstin Zillmer

photo by Rolf Schulten

A personalized exercise program is an important aspect of rehabilitation after fracture. These images show exercises used in a specialized rehabilitation program under professional supervision.

Key Things to Remember

- Move it or lose it! Bone mass and exercise are inextricably linked.
- Invest in your bones! Children should get plenty of exercise to help build their peak bone mass.
- Exercise, in addition to a healthy diet and lifestyle, can help to maintain your bone density and slow down the process that leads to osteoporosis.
- By improving balance, strength, and agility, exercise helps prevent falls that lead to fractures.
- Impact and weight bearing exercises are best – consider skipping, jogging or weight training instead of swimming or cycling.
- Exercise can help with rehabilitation. It is never too late to start exercising, but consult your doctor about what level and what type of exercise is best for you.

Exercise your Bones

Regular weight-bearing exercise helps build up bone mass in young people and helps maintain it in adults. For people who do not engage in any physical activity, now is the time to start, no matter what age. Those who do have a regular exercise program should evaluate whether it is one that contributes to bone health and if not, begin to include activities that do. Here are some pointers:

Exercise for Bone Health

• People with medical conditions or those who have not been exercising regularly should consult a doctor before starting any exercise program. A physiotherapist can best advise on the most suitable and safest forms of exercise.

• Weight-bearing and high impact exercise is required to stimulate bone formation. Sports that involve lifting weights, running, sprinting, jumping and skipping are good. Low impact, low load sports like swimming and cycling are beneficial for cardiovascular health and improving muscle strength, but will not promote bone formation. Here are some examples of exercises for bones:

- Walking
- Jogging
- Dancing
- Tennis
- Volleyball
- Strength training or resistance-training programs through a local gym

• Start slowly and progress gradually.

• Short duration, intense exercise builds bone most efficiently. Short sprints are better than a long, slow jog.

• Two short exercise sessions separated by 8 hours, is better than one long one.

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

• Exercise that improves posture and balance will help protect from falls and reduce the likelihood of having a bone fracture.

• Maintain a balanced, healthy diet and lifestyle – exercise alone cannot prevent osteoporosis. Calcium and vitamin D are also required for building and maintaining bone mass, and smoking and excessive alcohol intake can contribute to bone loss. For some individuals, where appropriate, prescription drugs may also be required to keep bone loss in check.

photo by Kerstin Zillmer

Exercise should be fun! Choose an activity that you enjoy – tennis, walking, dancing, or other sports.

Exercise for Managing Osteoporosis

As described above, weight-bearing and strength training exercise is important. However, it is recommended that a doctor, nurse, or physiotherapist be consulted before beginning an exercise program. Here are some guidelines:

• Start a basic strengthening program

• Be aware of falling. If possible, enroll in a falls prevention program

• People with osteoporosis and those who have had fractures must be aware of certain limitations and must take precautions when exercising. For example:
  – avoid jarring or twisting movements
  – avoid abrupt and sudden or high impact movements
  – avoid abdominal curl-ups
  – avoid forward bending from the waist
  – avoid heavy lifting

More intensive supervised exercise programs, specifically designed for people with low bone mass, have proven to be especially effective in maintaining bone density and skeletal health[25].

Exercise after fracture aims to relieve pain and to help patients regain range of motion and independence. Often exercise in warm water is the first step before other exercises are attempted.

Exercise for Rehabilitation after Fracture

Exercise after fracture aims to relieve pain and to help patients regain range of motion and independence. Supervision from a physiotherapist is vital to ensure that an exercise program is best suited to individual needs, and to help reduce the risk of further injury through falling. Often exercise in warm water is the first step before other exercises are attempted.

Don’t Overdo It

It is possible to exercise too much. Exercise should be tailored on an individual basis. Consider these important facts:

• Women and teenage girls who exercise to an extreme degree can develop amenorrhea (cessation of menstruation) due to estrogen deficiency. Estrogen deficiency in younger women contributes to bone loss, in much the same way that estrogen deficiency after menopause does.

• Preoccupation with excessive exercise may go hand in hand with eating disorders, such as anorexia or bulimia. The loss of essential nutrients associated with these disorders has a harmful effect on bone, and in anorectics, extreme body thinness often results in amenorrhea.

• Both male and female athletes who practice excessive exercise without adequate caloric intake are at heightened risk of osteoporosis. Athletes who train hard while trying to keep their weight below a certain level for competitive reasons are at particularly high risk.

• Too much exercise can result in stress fractures or joint damage.

• The elderly and those who already have osteoporosis can put themselves at risk of fracturing if they suddenly begin a strenuous exercise regimen. Consult a physician first. Build an exercise program gradually.

• Some exercises or sports increase the likelihood of falling and hence of fracturing a bone. Exercise regimens should be tailored to each individual’s own abilities and circumstances.

Case Studies

Margaret Austin, New Zealand

"It is really worthwhile to invest in your bones."

Margaret Austin has lived in Christchurch, New Zealand, for the past 50 years. She taught the biological sciences at local secondary schools before being elected to Parliament in 1984. In 1988, at 55 years old, Margaret Austin had been postmenopausal for 10 years. Though she was very active and walked daily, she had begun to notice herself stooping, which caused a slight loss of height. Suspecting the problem was osteoporosis, her doctor prescribed a bone density scan, which revealed that Margaret did, indeed, have the disease and was at a high risk for fractures. In consultation with her doctor, she decided to make immediate changes in her life to try, if not to stop the disease, to at least retard the damage.

"I had always enjoyed swimming," explains Margaret, "and considered myself reasonably fit as a result, and certainly healthy. Now I made a conscious decision to transfer to the gym, and for the last 15 years have followed a regular program three times a week. It includes 30 minutes of cardiovascular exercise and 30 minutes of a weights program which changes every 2-3 months so as many muscles as possible are exercised."

For 12 years, Margaret supplemented her exercise regimen with hormone replacement therapy and a calcium supplement, but switched three years ago to a combination of calcium and a bisphosphonate, a drug which reduces the risk of fractures by slowing bone loss. She has suffered some setbacks; she fractured her tibia and fibula when, on a hike through a national park, her right leg became caught behind the trunk of a shrub. However, she and her doctor believe that her level of fitness at the time helped in her recovery, which has been trouble-free. She has not altered her exercise regimen as a result, and feels confident that her muscle tone is very good. Since then, she has done some light hiking and walks regularly in addition to her gym routine. A recent bone density scan showed that the bone density had increased in her hips and spine and were average for her age.

She has recently retired from her position of chancellor at Lincoln University, but remains the Chair of the National Commission for UNESCO in New Zealand, and continues to be involved in health activities and the arts in Christchurch. "I think I have been very fortunate," says Margaret. "I have had not any pain at all as a result of stooping and it certainly did not get in the way of work or social life."

Preventing the onset of osteoporosis is ideal, but it is never too late to begin on a path to restoration or at least management of fragile bones. Margaret's credo is determination: "Never give up, keep up with the exercise and it is possible to feel confident that it is really worthwhile to invest in your bones."

Anne Wong, Hong Kong

"Now I have confidence in fighting osteoporosis."

Anne Wong, 64, had suffered from low back pain since her early sixties. Her chronic pain kept her from doing household work and curtailed her daily activities. She recalls, "I was in so much pain when I stood or sat for a long period. It interfered with my life and I was depressed. Soon I found that my neck and shoulders were humped, but I thought that the back pain and bent back were common in old women, so I did not consult a doctor."

Three years ago, Anne slipped on the bathroom floor during bathing and suffered a severe compression fracture of the spine. After being hospitalized for two weeks, she had a bone density test confirming that she had osteoporosis and low bone mineral density. Her physical therapist taught her stretching and strengthening exercises, and explained that these activities could rebuild a weak skeletal frame, improve postural symmetry, and also help to reduce falls. Anne decided to incorporate what she had learned into a serious exercise regimen. Now, she does stretching and strengthening exercises for one hour twice a week. She also practices Tai Chi for half an hour each morning.

Anne's physician has found that she had no further reduction in height, and also had an increase in bone density with medication. Her back pain is gone. Her muscle strength has improved significantly and she has much better coordination. "I am aware of the importance of regular exercise," says Anne. "I feel much stronger and happier. Now I have confidence in fighting osteoporosis."

Celia Marcela Casals, Argentina

"I dared to run in three marathons!"

"I first heard about osteoporosis when my mother suffered a hip fracture at 60 years of age. She then suffered a tragic series of fractures and died as a result of another hip fracture.

"At that time I practised no physical activity whatsoever, despite the fact that my genetic background suggested a high risk of osteoporosis. In January 1993, I met Dr. José Zanchetta (shown in photo), the head of the Instituto de Investigaciones Metabolicas in Buenos Aires, for treatment of a parathyroid adenoma. It was then that I was diagnosed with osteoporosis and became aware that I had to take care of my own body and change my lifestyle.

"I am a lawyer and a psychologist but nowadays I only work as the latter, attending to individual cases in my office. I organize myself in order to devote enough time to my job as well as to my integral health and my physical activity. I now take calcium supplementation and medication and devote lots of time to exercise. I started with expressive rhythmic movement. In 1995, I began Yoga Iyengar, which involves strength and stretching. I practised it two hours per day for five years. In 1999, I tried aerobic gym for which I have developed an increasing enthusiasm with each passing day. I accompany all this with weight-bearing exercise, which helps me increase my bone mineral density and strengthen my support structure. I suffer no pain at all, so common in people my age.

"In 2003, I got acquainted with combat fitness, a combination of martial arts, aerobics and boxing. Practising this gives me enormous pleasure because it connects me with joy, power, strength, speed and the coordination of movements. It's really pleasing to see and feel that with constancy and perseverance, at 64, I am able to practice the same physical activity that my younger colleagues perform.

"As from July 2004, I started to jog with a personal trainer. At present I jog three times a week, very early in the mornings. I always use a cardiotachometer to check my heart rate. I still take my gym lessons in the evenings.

"I am fortunate to have the support and encouragement of my doctor who told me to do all the exercise I wished but to be careful so as not to suffer any fractures or lesions which are very difficult to recover from at my age. So, after having positive cardiological checkups, I dared to participate in three marathons!
"Tests have shown that my osteoporosis as well as my lumbar osteopenia have improved a lot. At present, I enjoy good psychophysical health, great energy and emotional stability – and I believe that this is largely due to all the physical activity I engage in."

Gonul Erdinc, Turkey

"Exercise has become part of my daily life."

Gonul Erdinc, 68, is a retired teacher who was diagnosed with osteoporosis at the age of 64. After suffering from recurrent back pain, and having noticed that she was increasingly 'hunched over', Gonul went to her doctor. A subsequent bone mineral density text showed that she had osteoporosis. Although her doctor had prescribed medicine, Gonul did not take it regularly and even discontinued therapy completely for a few years.

Then, seven months ago, as she was bending forward to hug her grandchild, Gonul suddenly felt a severe pain in her back. She returned to her doctor who diagnosed an osteoporotic vertebral fracture. Gonul resumed her medication, and after treatment of the acute post-fracture phase, was put on a regular exercise and walking program.

Now, Gonul takes her medicine regularly and makes sure she follows her doctor's advice. Her exercise program includes range of motion exercises for the neck, and stretching and strengthening exercises for all the muscles of the body, especially the back extensors' muscle. She also jogs three days a week.

"Since doing these exercises I feel better and more active," says Gonul. Before beginning the exercise program, she had suffered severe pain after doing the housework or shopping. "Now I am able to do the housework independently and go shopping by myself without pain. However, I'm careful. When I go shopping I try to carry small, light shopping bags rather than heavy ones."

Gonul believes that her regular exercise is as effective as a pain relieving drug for her back pain and says, "I'm happy that exercise has become part of my daily life – I would recommend it for everyone".

Maureen Dunn, Canada

"No one should let their osteoporosis hold them back."

Maureen Dunn found out she had osteoporosis 10 years ago. She had fallen and broken her wrist after a thief had knocked her down while attempting to steal her purse. A bone density scan confirmed what even the X-ray had revealed: severe osteoporosis.

As a child, Maureen had always been thin and never liked milk and dairy products. Although physically active, her aversion to dairy products continued into adulthood, and low calcium intake may have contributed to her developing osteoporosis in later years.

Prior to her diagnosis, Maureen was an avid runner, an activity she enjoyed with her husband and was deeply passionate about. Despite the fact that she was diagnosed with osteoporosis at the age of 58, Maureen continues to run today – taking more careful steps, perhaps – but it's still a very big part of her life. In fact, she runs a few days every week and exercises with weights every other day.

She also makes sure that she gets enough calcium, by drinking at least one glass of milk a day, eating calcium-rich foods and taking a calcium supplement with vitamin D. Maureen also loves to travel and has recently returned from a five-week trip to Tuscany, Italy, where she walked the 463 steps to the top of the famous Duomo in Florence.

"I strongly believe that my active lifestyle is helping me overcome the physical burden that is often associated with osteoporosis," says Maureen. "No one should let their osteoporosis hold them back."

Maureen hopes to encourage and motivate others to integrate physical fitness into their lives – despite osteoporosis or their age. She is a volunteer at the Osteoporosis Society of Canada's 1-800 help line, answering information calls one afternoon per week. Maureen has also demonstrated exercises in the Society's BoneSmart exercise video.

Where to Get Additional Information

There are many excellent resources which provide information about exercise. Below is a small selection of English-language resources for the public:

Videos

- Be Bone Wise™ Exercise Video
  National Osteoporosis Foundation (USA)
  Available through www.nof.org

- BoneSmart Video
  Osteoporosis Society of Canada
  Available through www.osteoporosis.ca

- Falls Prevention Exercise Video
  Osteoporosis Australia
  Available through www.osteoporosis.org.au

Publications

- Exercise for Strong Bones:
  Your Easy-to-follow Guide to Reducing Your Risk of Osteoporosis by Joan Bassey, Susie Dinan (Carroll & Brown Fitness Book, ISBN 1903258383)

- Exercise and Osteoporosis:
  Exercises for
  people with osteoporosis
  National Osteoporosis Society
  Available through www.nos.org.uk

- Fit but Fragile
  National Osteoporosis Society
  Available through www.nos.org.uk

- Be Taller, Stronger, Longer!
  Osteoporosis Society of Canada
  Available through www.osteoporosis.ca

Website

- WHO pages on diet and physical activity
  www.who.int/dietphysicalactivity/en/

In addition, many other IOF member societies have comprehensive exercise programs and materials applicable to local conditions and produced in local languages.

Please visit www.osteofound.org to find contact details for your national osteoporosis society.

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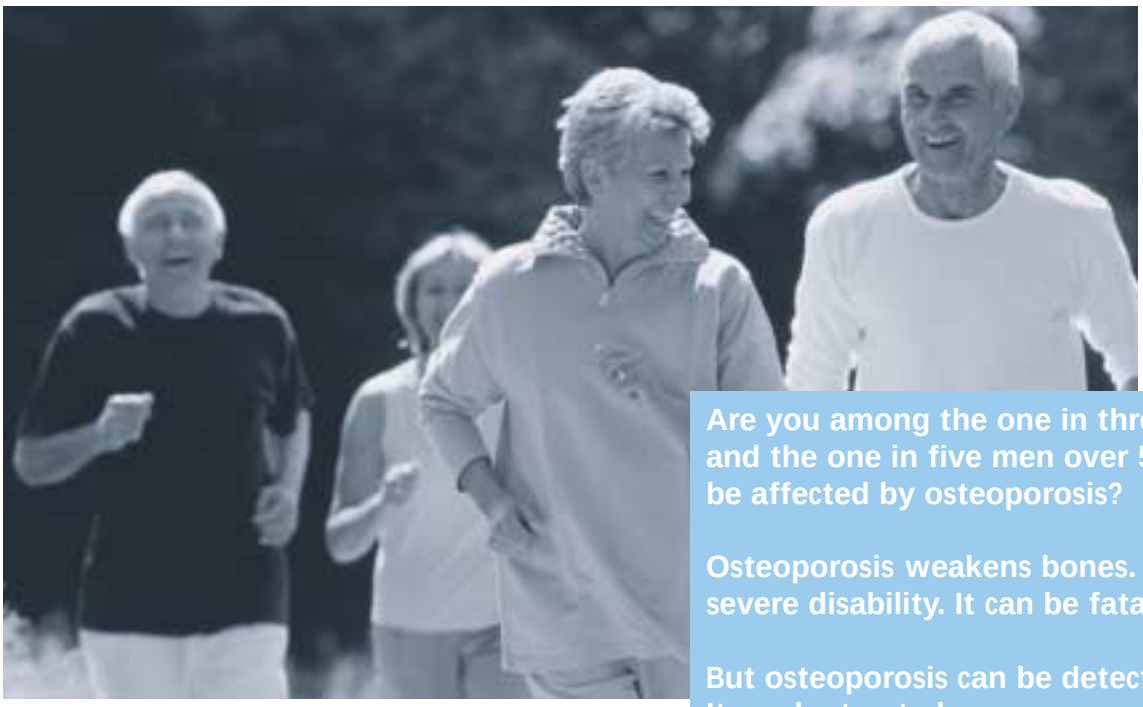

Are you among the one in three women and the one in five men over 50 who will be affected by osteoporosis?

Osteoporosis weakens bones. It causes severe disability. It can be fatal.

But osteoporosis can be detected early. It can be treated.

Are you at risk of osteoporosis?

Take the One-Minute Osteoporosis Risk Test

1. Have either of your parents broken a hip after a minor bump or fall?
   ❑ Yes ❑ No
2. Have you broken a bone after a minor bump or fall?
   ❑ Yes ❑ No
3. Have you taken corticosteroid tablets (cortisone, prednisone,etc) for more than 3 months?
   ❑ Yes ❑ No
4. Have you lost more than 3 cm (just over 1 inch) in height?
   ❑ Yes ❑ No
5. Do you regularly drink heavily (in excess of safe drinking limits)?
   ❑ Yes ❑ No
6. Do you smoke more than 20 cigarettes a day?
   ❑ Yes ❑ No
7. Do you suffer frequently from diarrhoea (caused by problems such as celiac disease or Crohn's disease)?
   ❑ Yes ❑ No
8. **For women:** Did you undergo menopause before the age of 45?
   ❑ Yes ❑ No
9. Have your periods stopped for 12 months or more (other than because of pregnancy or menopause)?
   ❑ Yes ❑ No
10. **For men:** Have you ever suffered from impotence, lack of libido or other symptoms related to low testosterone levels?
    ❑ Yes ❑ No

If you answered "yes" to any of these questions, it does not mean that you have osteoporosis. Diagnosis of osteoporosis can only be made by a physician through a bone density test. We recommend that you show this test to your doctor, who will advise whether further tests are necessary. The good news is that osteoporosis can be diagnosed easily and treated.

Talk to your local osteoporosis society about what changes you might make in your lifestyle to reduce your osteoporosis risk. You can contact your national osteoporosis society via

www.osteofound.org

International
Osteoporosis
Foundation

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IOF is an international non-governmental organization which represents a global alliance of patient, medical and research societies, scientists, health care professionals and the health industry. IOF works in partnership with its members and other organizations around the world to increase awareness and improve prevention, early diagnosis and treatment of osteoporosis. Although osteoporosis affects millions of people everywhere, awareness about the disease is still low, doctors often fail to diagnose it, diagnostic equipment is often scarce, or not used to its full potential, and treatment is not always accessible to those who need it to prevent the first fracture. IOF's growing membership has more than doubled since 1999, reflecting the increasing international concern about this serious health problem. There are 179 member societies in more than 80 locations worldwide (June 2005).

For more information about IOF and to contact an IOF member society in your country visit: www.osteofound.org

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Bone & Joint Decade

International Council of Nurses

European Institute of Women's Health

International Alliance of Patients' Organizations

European Men's Health Forum

International Society of Physical and Rehabilitation Medicine

"If more people were empowered to look after their own health we could substantially reduce the impact of osteoporosis. IOF is encouraging people to take responsibility for their bone health. I like that kind of practical, empowering approach. We're not victims, we're responsible."

Her Majesty Queen Rania of Jordan, IOF Patron

The WHO "Move for Health" initiative

A 2002 WHO resolution urges Member States to celebrate a 'Move for Health' day each year to promote physical activity as an essential for health and well being. It also urges countries to develop global and national strategies on diet, physical activity and health within an integrated approach to non communicable disease prevention and health promotion.