

# BONE DENSITY: Myths and Truths

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An aging, health-oriented population has resulted in widespread interest in osteoporosis prevention. Most older adults (60+) are well aware that weakened bone structures can turn a minor fall into major disability. Osteoporosis, although striking women more frequently, affects men as well. Regular exercise, especially weight training, has a positive effect on bone tissue formation. Bone renews itself through a process called bone remodeling, which involves two phases – formation and resorption. Bone tissue formation, also called ossification, is the process by which soft cartilage transforms into hard bone. Bone resorption is the process by which osteoclasts (specialized cells that secrete enzymes that dissolve bone) break down bone and transfer calcium, magnesium, and phosphate products from bone fluid to the bloodstream – ultimately weakening bone structure. Bone resorption can be the result of disuse and lack of stimulus for bone maintenance – that is to say, lack of physical activity. During childhood, bone formation exceeds resorption, but as people enter their 40s and 50s, resorption exceeds formation. Preventing bone resorption is one of the central arguments for promoting physical activity.

What type of exercise most favourably mitigates bone resorption? More specifically, is it the anti-gravity nature of weight bearing exercise modalities – such as running or walking – or it is muscle contractions themselves, which have a positive effect on the maintenance of bone density? Researchers do not yet fully understand the series of signals that occur in skeleton to promote bone growth. Furthermore, it is difficult to separate out these two stimuli as many exercise movements incorporate both gravitational forces, as well as forces

**T**hese days, people are not only interested in longevity – they wish to stay active and healthy as long as possible. Research has demonstrated that maintaining a physically active lifestyle as we age can delay the onset of age-related disease and disability by a remarkable 15-20 years. Of course, everyone dies eventually, and modern medicine in many cases allows individuals to live for years with serious health problems that would have killed swiftly in

past decades. The crucial issue here is not number of years lived – it is the quality of life one maintains through the aging process. We all know someone – or many people – who develop a myriad of health problems in their 50s and 60s, although they may live another 20 years with great pain and disability. On the other hand, most of us can name an individual we know who manages to stay active, independent and relatively healthy until their 80s or even beyond.

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# EXERCISE SPECIALIST RECOMMENDATIONS:

- **Design client programs that follow the American College of Sports Medicine (ACSM) guidelines for physical activity:** 30 minutes of moderate intensity cardiovascular activity five days per week. “Moderate” is 6-7 out of 10 on the Borg Scale of Perceived Exertion, where a 10 is maximal effort that cannot be sustained for longer than 90 seconds for the average individual, three minutes for a highly trained athlete.

- **Include a mixture of different activities that are both weight- and non weight-bearing, gravitational and non-gravitational.** A sample program might include three brisk walks, one bike ride, and one swim. The elliptical trainer, which loosely mimics the movement pattern of running, but uses muscles in a different way, is also a good option, but bear in mind that although the client is standing up while exercising, this modality is non-gravitational.

- **Encourage clients to swim,** but ensure that the program also involves exercise modalities with a gravitational component.

- **Craft a safe, comprehensive resistance training program in order to capitalize on the muscle force production contribution to bone health.** This program should follow a protocol of progressive resistance, whereby the resistance/weight is gradually progressed. This allows the client to increase strength and stress on the skeletal system in a manner that minimizes the risk of injury. Based on the body of evidence on the beneficial effects of force production on bone health, the popular protocol of high repetitions with very light weights (i.e. 1-3 lb weights for most women) will not produce desired results.

- **Design a corrective exercise program that has the client engage in daily exercises that challenge balance and ambulatory stabilization.** As mentioned, fractures are the result of weak bones as well as poor balance. Have clients execute balance exercises first, as other forms of exercise compromise the ability to balance. As well, a cognitive component can also be included, for example, while standing on one foot the client can count backwards from 30, or name all the United States. You can also add a vestibular challenge by having her close one eye at a time or squint.

- **Educate clients on the importance of making a concerted attempt to adopt a routine of regular exercise throughout the lifespan,** even during periods when external demands leave little time for self-care. While it is never too late to begin an exercise program, it is always better to start at a younger age when most people’s bodies are more receptive to the higher intensity exercise regimens that are ideal for circumventing bone loss in the first place.

produced by muscle alone. For example, when we walk the lead leg hits the ground and absorbs the force of gravity; at the same time, the other leg rises on accord of muscle force alone. It appears that bone growth is very sensitive and responsive to different patterns of muscle force recruitment, in addition to various speeds of force and contraction.

The bottom line is that there is highly convincing evidence that being physically active dramatically reduces the risk of hip fractures – the most debilitating type of fracture caused by osteoporosis. Moderate to vigorous physical activity has been associated with a reduced hip fracture risk of 45%

in men, and 38% in women. The risk of hip fractures is related to loss of bone strength, as well as deficits in balance that increase the risk of falling. A hip fracture is more than a broken bone – 25% of people over the age of 50 who sustain a hip fracture will die within one year of the injury.

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