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Exercise and bone mass in adults.

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Abstract

There is a substantial body of evidence indicating that exercise prior to the pubertal growth spurt stimulates bone growth and skeletal muscle hypertrophy to a greater degree than observed during growth in non-physically active children. Bone mass can be increased by some exercise programmes in adults and the elderly, and attenuate the losses in bone mass associated with aging. This review provides an overview of cross-sectional and longitudinal studies performed to date involving training and bone measurements. Cross-sectional studies show in general that exercise modalities requiring high forces and/or generating high impacts have the greatest osteogenic potential. Several training methods have been used to improve bone mineral density (BMD) and content in prospective studies. Not all exercise modalities have shown positive effects on bone mass. For example, unloaded exercise such as swimming has no impact on bone mass, while walking or running has limited positive effects. It is not clear which training method is superior for bone stimulation in adults, although scientific evidence points to a combination of high-impact (i.e. jumping) and weight-lifting exercises. Exercise involving high impacts, even a relatively small amount, appears to be the most efficient for enhancing bone mass, except in postmenopausal women. Several types of resistance exercise have been tested also with positive results, especially when the intensity of the exercise is high and the speed of movement elevated. A handful of other studies have reported little or no effect on bone density. However, these results may be partially attributable to the study design, intensity and duration of the exercise protocol, and the bone density measurement techniques used. Studies performed in older adults show only mild increases, maintenance or just attenuation of BMD losses in postmenopausal women, but net changes in BMD relative to control subjects who are losing bone mass are beneficial in decreasing fracture risk. Older men have been less studied than women, and although it seems that men may respond better than their female counterparts, the experimental evidence for a dimorphism based on sex in the osteogenic response to exercise in the elderly is weak. A randomized longitudinal study of the effects of exercise on bone mass in elderly men and women is still lacking. It remains to be determined if elderly females need a different exercise protocol compared with men of similar age. Impact and resistance exercise should be advocated for the prevention of osteoporosis. For those with osteoporosis, weight-bearing exercise in general, and resistance exercise in particular, as tolerated, along with exercise targeted to improve balance, mobility and posture, should be recommended to reduce the likelihood of falling and its associated morbidity and mortality. Additional randomized controlled trials are needed to determine the most efficient training loads depending on age, sex, current bone mass and training history for improvement of bone mass.

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