

## Osteoporosis Interventions and Aquatics Response

**Article Reviewed.** Vondracek, S.F., & Linnebur, S.A. 2009. *Diagnosis and management of osteoporosis in the older senior. Clinical Interventions in Aging, 4, 121–36.*

With advancing age, the risk of osteoporosis and bone fracture increases. Case in point—the prevalence of osteoporosis, based on hip bone density, has been estimated at 4% in women 50–59 years of age and 44% in women ≥80 years of age. Vondracek and Linnebur state that hip fractures and their associated costs could double or triple throughout the world by 2040. They add that hip fracture risk rises dramatically with age, with only 50% of people able to return to their “prefracture” movement ability level. Sadly, 20%–40% of patients die within the first year following a hip fracture.

The risk of falling increases noticeably with age. Vondracek and Linnebur highlight the fact that 50% of seniors 85 years of age and older will fall at least once per year. Causes include impaired balance, limited gait and mobility, poor vision, reduced muscle strength, declining cognition and use of multiple medications. They also note that older seniors tend to fall backward or sideward and are thus unable to catch themselves or break the fall.

Vitamin D deficiency is highly associated with poor bone strength and falls. According to Vondracek and Linnebur, data suggest that most older men and women in the U.S. are low in vitamin D. This same vitamin is important for maintaining function and strength in muscles, particularly those weight-bearing muscles of the lower body. Muscle weakness in older adults is characterized by difficulty in climbing steps, rising from a chair, walking distances and participating in outdoor activities. Older adults with vitamin D deficiency may tire easily with weight-bearing physical movement and may feel heaviness in the legs.

All seniors with osteoporosis should receive adequate vitamin D and calcium. Supplementation is almost always recommended, since diet alone is usually unsatisfactory. Calcium and vitamin D supplementation has been found to significantly reduce fracture risk and bone loss in the spine, note Vondracek and Linnebur. They recommend 1,200–1,500 milligrams of calcium daily, divided into two to three doses. To avoid deficiency in vitamin D, the authors propose taking 800–1,000 IU vitamin D<sub>3</sub> daily *or* 50,000 IU vitamin D<sub>2</sub> every 2–4 weeks. To treat vitamin D deficiency, the authors recommend 50,000 IU of vitamin D<sub>2</sub> every week.

Smoking cessation has also been shown to promote an increase in bone mineral density in older seniors. Quitting smoking reduces hip fracture risk as well. Notably, the degree to which smoking cessation decreases the risk of cardiovascular and pulmonary disease makes this behavior change essential for older adults.

Exercise, smoking cessation and adequate intake of calcium and vitamin D are recommended to preserve bone mineral density and reduce the risk of falling in older adults. Bone-loading

exercises for the spine and hip (e.g., squats and lunges with resistance) should be included in a well-developed exercise plan for seniors. A fall prevention program and a home environment modification plan are advocated for older men and women.

**Practical Application.** Based on existing data showing that older adults are at high risk for osteoporosis, professionals are advised to use the current older-adult guidelines summarized by Vondracek and Linnebur, together with the ACSM guidelines, to help their senior clients fully enjoy the benefits of an active physical lifestyle.

### June Chewing's Thoughts...

The recommended standards for prevention and treatment of osteoporosis has remained relatively consistent over the past decade. The vast array of possible exercise programs for osteoporosis prevention and treatment that meet ACSM guidelines require continued research to sort out program effectiveness.

A current meta-analysis conducted in 2017 explores whether water-based exercise (AE) is effective in preventing age-related bone deterioration in middle-aged and older adults. This is a question that has been debated for over a decade with inconsistent results found in aquatic research.

Conducting aquatic research that meets acceptable standards in the research community poses many challenges due to the number of variables that need to be controlled in the water. These variables include the effects of immersion on many bodily systems, environmental and physiological variables, and the vast array of diverse exercise programs that can offered in the water environment. This is evident in this meta-analysis where with 86 articles meeting full review criteria, only 11 articles met eligibility requirements with a total of 629 participants to be included in the meta-analysis.

The 11 studies included either compared an aquatic exercise group (AE) to a control group, or an aquatic exercise group (AE) to a land exercise group (LE). Following is a summary of the results:

- Significant differences were found between AE and control group in favor of AE for changes in bone mineral density at the lumbar spine (CI 95%) and femoral neck (CI 95%)
- Significant differences revealed between AE and LE in favor of LE for lumbar spine, however no significant differences between AE and LE for femoral neck BMD

The results from this meta-analysis indicate that aquatic exercise is better than no exercise, but land exercise appears to provide better results at the lumbar spine, but the interventions provide no significant differences between the 2 forms of exercise at the femoral neck. The researchers also recommended several additional study variables and factors to be considered in increasing the evidence-based criteria for future studies.

Meta-analysis Conclusion: "Water based exercise may have benefits with respect to maintaining or improving bone health in post-menopausal women but less benefit when compared to land-based exercise. Further research is required on this topic." So, the debate continues whether the water is a good place to prevent and treat osteoporosis. As with the many options for land-

based exercise, research needs to continue to search for the best protocols for exercise for osteoporosis in the water. There is strong implication that water-based exercise can increase BMD, reduce the rate of age-related bone loss in premenopausal women, has positive impacts on both bone metabolism and muscle strength, and may be a viable alternative if the participant cannot or does not want to exercise on land. We need the aquatic exercise research engine to churn out some well-designed research to continue to discover viable exercise protocols in the water for both women and men.

Reference:

Simas V, Hing W, Pope R, Climstein M. (2017) Effects of water-based exercise on bone health of middle-aged and older adults: a systematic review and meta-analysis. *Open Access J Sports Med.* Mar 27;8:39-60. eCollection 2017.