

### *Can physical activity improve bone mineral density or bone quality in adult women with osteoporosis or low bone mineral density?*

To answer this question, we performed a comprehensive search of the PubMed database (July 2009) for randomized, controlled trials and systematic reviews that addressed this specific research question.

Five studies met the criteria for inclusion in this review, evaluating the effect of walking, strengthening, and stretching (1,2), high impact walking, jumping, and strengthening (3), walking and other leg exercises (4), and lower body agility or whole body resistance training (5). All women were diagnosed with low bone mineral density (BMD) and two studies were conducted in elderly women (4,5). The outcomes evaluated for this review were bone quality by ultrasonography (1), BMD by dual x-ray absorptiometry (DXA) (2,3,4,5), and cortical bone density by peripheral quantitative computer tomography (5).

Three of the five studies showed significant effects of training on BMD with exercise compared to no exercise. One year of a moderate exercise program

completed by women with low BMD prevented a decline in hip BMD that was experienced by control subjects (2). A four year study among osteopenic women found that those who exercised were able to maintain hip and spine BMD, while those not exercising lost significant density in those areas (3). A 25 wk study among women over 75 yrs found exercise to significantly increase cortical bone compared to stretching, which showed decreases (5). Although the two remaining studies showed no significant between-group differences, there was still indications of a positive effect of exercise on BMD. Twenty wks of supervised exercise sessions showed significant improvements in bone quality among women with osteopenia or osteoporosis, with no changes shown among control subjects (1). Similarly, 30 wks of exercise among elderly women with low BMD prevented a significant loss of hip density shown in women who did not exercise, and resulted in significantly fewer fall-related fractures (4).

Based on this review, it can be concluded that exercise programs incorporating weight bearing or loading stresses will improve bone quality outcomes for women with osteoporosis or osteopenia.

*Check with the provider of this newsletter to learn more about exercises appropriate for this condition.*

1. Tolomio S, Ermolao A, Travain G, Zaccaria M. Short-term adapted physical activity program improves bone quality in osteopenic/osteoporotic postmenopausal women. *J Phys Act Health*. 2008 Nov;5(6):844-53.
2. Bergström I, Landgren B, Brinck J, Freyschuss B. Physical training preserves bone mineral density in postmenopausal women with forearm fractures and low bone mineral density. *Osteoporos Int*. 2008 Feb;19(2):177-83. Epub 2007 Sep 1.
3. Kemmler W, Engelke K, Weineck J, Hensen J, Kalender WA. The Erlangen Fitness Osteoporosis Prevention Study: a controlled exercise trial in early postmenopausal women with low bone density—first-year results. *Arch Phys Med Rehabil*. 2003 May;84(5):673-82.
  - a. **Two-year follow up:** Kemmler W, Lauber D, Weineck J, Hensen J, Kalender W, Engelke K. Benefits of 2 years of intense exercise on bone density, physical fitness, and blood lipids in early postmenopausal osteopenic women: results of the Erlangen Fitness Osteoporosis Prevention Study (EFOPS). *Arch Intern Med*. 2004 May 24;164(10):1084-91.
  - b. **Three-year follow up:** Kemmler W, von Stengel S, Weineck J, Lauber D, Kalender W, Engelke K. Exercise effects on menopausal risk factors of early postmenopausal women: 3-yr Erlangen Fitness Osteoporosis Prevention Study results. *Med Sci Sports Exerc*. 2005 Feb;37(2):194-203.
  - c. **Four-year follow up:** Kemmler W, Engelke K, von Stengel S, Weineck J, Lauber D, Kalender WA. Long-term four-year exercise has a positive effect on menopausal risk factors: the Erlangen Fitness Osteoporosis Prevention Study. *J Strength Cond Res*. 2007 Feb;21(1):232-9.
4. Korpelainen R, Keinänen-Kiukaanniemi S, Heikkinen J, Väänänen K, Korpelainen J. Effect of impact exercise on bone mineral density in elderly women with low BMD: a population-based randomized controlled 30-month intervention. *Osteoporos Int*. 2006 Jan;17(1):109-18. Epub 2005 May 12.
5. Liu-Ambrose TY, Khan KM, Eng JJ, Heinonen A, McKay HA. Both resistance and agility training increase cortical bone density in 75- to 85-year-old women with low bone mass: a 6-month randomized controlled trial. *J Clin Densitom*. 2004 Winter;7(4):390-8.