

Effects of High-Intensity Strength Training on Multiple Risk Factors for Osteoporotic FracturesA Randomized Controlled Trial

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Full Text

Abstract

Objective. —To determine how multiple risk factors for osteoporotic fractures could be modified by high-intensity strength training exercises in postmenopausal women.

Design. —Randomized controlled trial of 1-year duration.

Setting. —Exercise laboratory at Tufts University, Boston, Mass.

Population. —Forty postmenopausal white women, 50 to 70 years of age, participated in the study; 39 women completed the study. The subjects were sedentary and estrogen-deplete.

Interventions. —High-intensity strength training exercises 2 days per week using five different exercises (n=20) vs untreated controls (n=19).

Main Outcome Measures. —Dual energy x-ray absorptiometry for bone status, one repetition maximum for muscle strength, 24-hour urinary creatinine for muscle mass, and backward tandem walk for dynamic balance.

Results. —Femoral neck bone mineral density and lumbar spine bone mineral density increased by 0.005 ± 0.039 g/cm² (0.9% \pm 4.5%) (mean \pm SD) and 0.009 ± 0.033 g/cm² (10% \pm 3.6%), respectively, in the strength-trained women and decreased by -0.022 ± 0.035 g/cm² (-2.5% \pm 3.8%) and -0.019 ± 0.035 g/cm² (-1.8% \pm 3.5%), respectively, in the controls ($P=.02$ and $.04$). Total body bone mineral content was preserved in the strength-trained women ($+2.0 \pm 68$ g; 0.0% \pm 3.0%) and tended to decrease in the controls (-33 ± 77 g; -1.2% \pm 3.4%, $P=.12$). Muscle mass, muscle strength, and dynamic balance increased in the strength-trained women and decreased in the controls ($P=.03$ to $<.001$).

Conclusions. —High-intensity strength training exercises are an effective and feasible means to preserve bone density while improving muscle mass, strength, and balance in postmenopausal women.(JAMA. 1994;272:1909-1914)