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 Research Articles

## SYSTEMATIC STRENGTH TRAINING AS A MODEL OF THERAPEUTIC INTERVENTION: A Controlled Trial in Postmenopausal Women with Osteopenia<sup>1</sup>

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 Ilieva, Diana MD; Preisinger, Elisabeth MD; Seidl,  
 Georg MD; Huber, Johannes MD, PhD



Abstract

Physical exercise is often recommended as a therapeutic tool

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to combat pre- and postmenopausal loss of bone density. However, the relationship between training dosage (intensity, duration, frequency) and the effect on bone density still is undergoing discussion. Furthermore, the exercise quantification programs are often described so inadequately that they are neither quantitatively nor qualitatively reproducible. The aim of this investigation was to determine whether a clearly defined training of muscle strength, under defined safety aspects, performed only twice weekly, can counteract bone density loss in women with postmenopausal osteopenia. Data from 16 women in the training group (age,  $63.6 \pm 6.2$  yr) and 15 women in the control group (age,  $67.4 \pm 9.7$  yr), of comparable height and weight, were evaluated. Strength training was performed for 6 mo as continually adapted strength training, providing an intensity of about 70% of each test person's one repetition maximum. Bone mineral density of lumbar vertebrae 2 to 4 and the femoral neck was measured by dual-energy x-ray absorptiometry. Maximum performance in watts and parameters of hemodynamics were controlled with a bicycle ergometer test to maximal effort. In addition, metabolic data were assessed.

In the lumbar spine and femoral neck, the training group showed no significant changes, whereas the control group demonstrated a significant loss of bone mineral density, especially in the femoral neck ( $P < 0.05$ ). The strength increase was highly significant in all exercised muscle groups, rising to about 70% above the pretraining status ( $P < 0.001$ ). Heart rate and blood pressure data indicated a slight economization, and metabolism was not significantly influenced. Based on these findings, we conclude that continually adapted strength training is an effective, safe, reproducible, and adaptable method of therapeutic strength training, following only two exercise sessions per week.

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