Skeletal Adaptations to Different Levels of Eccentric Resistance Following Eight Weeks of Training

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ABSTRACT

INTRODUCTION: Coupled concentric-eccentric resistive exercise maintains bone mineral density (BMD) during bed rest and aging. We hypothesized that 8 wks of lower body resistive exercise training with higher ratios of eccentric to concentric loading would enhance hip and lumbar BMD.

METHODS: Forty untrained male volunteers (34.9±7.0 yrs, 80.9±9.8 kg, 178.2±7.1 cm; median (SD) were matched for leg press (LP) 1-Repetition Maximum (1-RM) strength and randomly assigned to one of 5 training groups. Concentric load (% 1-RM) was constant across groups, but each group trained with different levels of eccentric load (0, 33, 66, 100, or 138% of concentric) for all training sessions. Subjects performed a periodized supra LP and heel raise (HR) training program 3×wk⁻¹. For all groups using a modified Agilion Fitness System (Agilion Fitness AB, Boden, Sweden). Hip and lumbar BMD (g/cm²) was measured in triplicate pre- and post-training using DXA (Hologic Discovery®). Pre- and post-training means were compared using the appropriate ANOVA and Tukey’s post hoc tests. Within group pre- to post-training BMD was compared using paired t-tests with a Bonferroni adjustment.

RESULTS: There was a main effect of training on L1, L2, L3, L4, total lumbar, and greater trochanter BMD. L3 BMD increased in only the 33% group. Greater trochanter BMD increased after training only in the 138% group. Foot (g·cm⁻²) was measured in triplicate pre- and post-training using DXA (Hologic Discovery®). Pre- and post-training means were compared using a repeated measures ANOVA for between groups differences. Within-groups pre- to post-training BMD was compared using paired t-tests with a Bonferroni adjustment. Statistical significance was defined at a p < 0.05.

CONCLUSION: Eight weeks of lower body resistive exercise increased greater trochanter and lumbar BMD. Inability to detect group differences may have been influenced by a potentially osteogenic environment associated with device operation in the 0, 33, and 66% groups.

REFERENCE