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

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RESULTS

INTRODUCTION:

Coupled concentric-eccentric resistive exercise maintains bone mineral density (BMD) during bed rest and aging.

PURPOSE:

We hypothesized that 8 wks of lower body resistive exercise training with higher ratios of eccentric to concentric loading would increase hip and lumbar BMD.

METHODS:

Forty untrained male volunteers (34.9±7.0 yrs, 80.9±9.8 kg, 178.2±7.1 cm; mean±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 8 training sessions. Subjects performed a periodized supine LP and heel raise (HR) training program (3 wk of familiarization, 3 wk of 1-RM training, 2 wk of pre-testing, and 1 wk of post-testing) (Figure 1). The program included acute vocal and visual cues associated with device operation in the 0, 33, and 66% groups.

RESULTS:

Pre and post 1-RM strength increased from pre to post-training in the 0% and 33% groups. There were no differences between groups (Figure 2). Greater trochanter BMD increased after training only in the 138% group. Osteogenic vibration associated with device operation in the 0, 33, and 66% groups. Hip and lumbar BMD (g·cm⁻²) 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 post tests. Within group pre-to-posttraining BMD was compared using paired t-tests with a Bonferroni adjustment. Statistical significance was defined as p < .05.

DISCUSSION:

Greater trochanter BMD increased in all groups except the 100% group. L1 and L2 BMD increased from pre to post-training in the 33% and 66% groups. L3 BMD increased in only the 33% group. L4 BMD increased from pre to post-training in the 66%, 100%, and 138% groups. There was no change in the 0% and 33% groups.

REFERENCES:


FIGURES:

Figure 1: Leg press/heel raise resistive device

Figure 2: Mean 1-RM eccentric and concentric training loads across sessions

Figure 3: Pre- and post-training BMD in the hip and spine. *Significantly different from pre-training*