

The Effects of Resistance Training and Protein Supplementation on Bone Mineral Density in Untrained Women

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ABSTRACT

Peak bone mass has been found to plateau at approximately 30 years of age; therefore, is it important to develop a higher peak bone mass early in life. Resistance exercise has been shown to improve bone mineral density (BMD) based on a great enough strain and mechanical load to promote bone formation. Resistance exercise is known to stimulate muscle protein synthesis, which can thereby raise individual protein needs above the recommended daily allowance (RDA). Resistance training (RT) combined with a protein intake above the RDA (> 0.8 g/kg/day) may be superior in promoting greater changes in BMD compared to RT alone. **PURPOSE:** Examine the effects of RT and protein supplementation on BMD in untrained females. **METHODS:** The 20 subjects, aged 18 years to 28 years, were divided into two groups: protein group ($n = 12$) and control group ($n = 8$). The total body, RT program was implemented through classic periodization of 3 non-consecutive days per week for 10 weeks. The protein group received 24g of whey protein immediately post-workout while the control groups consumed water only. For each RT session, subjects performed the resistance exercises on weight machines in the following order: bench press, leg press, latissimus dorsi pull-down, shoulder press, biceps curl, triceps extension, hamstring curl, leg extension, and abdominal curl. The following measurements were analyzed pre- and post-training with two-way mixed effects ANOVAs (time x condition): bone mineral density (g/cm^2) via dual-energy X-ray absorptiometry (DXA), lean body mass (g) via DXA, muscular strength (1RMs) via leg press and bench press machines, and protein intake ($\text{g}/\text{kg}/\text{day}$) via 24hr diet recall. Statistical significance was set at $p \leq 0.05$. **RESULTS:** There was a significant increase in BMD, lean body mass, and muscular strength from pre- to post-measurements ($p = .018$; $p = .001$; $p < .001$ respectively), but no significance differences between the protein group (PRO) and control group (CG) ($p = .76$). Additionally, there were no significant differences in daily protein intake (g/kg) between the PRO and CG and both groups consumed an average of 1.13 $\text{g}/\text{kg}/\text{day}$ of protein. **CONCLUSION:** Ten weeks of a total body, linear periodized RT program, ranging from 60 to 80% 1RM, elicits positive changes in BMD, lean body mass, and strength.