Musculoskeletal Response to Exercise Is Greatest in Women with Low Initial Values

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ABSTRACT


Introduction:

The "initial values" principle of exercise training states those with the lowest initial values of a physiologic system have the greatest capacity for improvement in response to training. We sought to determine whether initial values predicted the musculoskeletal response to training in premenopausal women (N = 31) who participated in a 1-yr program of resistance and jump training designed to improve physical indices of fracture risk. Significant improvements in trochanteric bone mineral density (BMD), hip abductor strength, power, and postural stability occurred in response to training.

Methods:

To determine the predictive power of initial values, we performed separate stepwise regression analyses for each variable including the following dependent variables: age, initial value, highest weight lifted during training, and total number of exercise sessions attended.

Results:
In each case, the initial value was the most significant predictor of percent change in response to training. Initial values explained 15-29% of the variance in the magnitude of the training response. For each unit lower BMD of the greater trochanter (0.01 g·cm$^{-2}$), the training response was 12% greater. For each unit decrease in initial strength (1 N·m), power (1 W), and stability (1 SI unit), the training response was 1.0%, 0.2%, and 8.0% greater, respectively. When categorized by quartile of initial values, women in the lowest quartile had two- to fivefold greater improvements in musculoskeletal measures than those in the upper quartile.

**Conclusion:**

Women who began training with the lowest initial values had the greatest improvements in hip BMD, hip abductor strength, leg power, and postural stability. These results support the training principle of initial values and suggest that this training program may be most successful in premenopausal women with lower values of musculoskeletal indices of fracture risk.

**Key Words:** BONE MINERAL DENSITY; EXERCISE; FRACTURE RISK; TRAINING PRINCIPLE; FALLS; PREMENOPAUSAL