METHODS: Thirty-one women (20.9 ± 2.1 yrs) were randomly assigned to a low-intensity treadmill walking (WALK, n=10), a low-intensity treadmill walking with BFR (BFR, n=11), or a non-exercise control group (CON, n=10). BFR and WALK groups walked on a treadmill at 45% VO2peak for up to 20 minutes four days per week for 12 weeks. The BFR group wore 5 cm wide electronically monitored elastic pressure cuffs (Kaatsu-Mini, Tokyo, Japan) around their upper thighs during walk training. BFR cuffs were inflated to an initial pressure of 140 mmHg for the first four weeks, increased by 20 mmHg at week five (160 mmHg), and again at the start of week nine (180 mmHg). The CON group was asked not to change their normal physical activity levels or dietary habits during the study. Fasted morning blood samples at baseline and post-training were assayed for bone-specific alkaline phosphatase (Bone ALP, U/L) and tartrate-resistant acid phosphatase isoform 5b (TRAP5b, U/L).
RESULTS: Serum bone marker levels were not different between groups at baseline. Significant time (p=0.002) and group x time interaction (p=0.02) effects were detected for Bone ALP. Bone ALP was reduced in both BFR (pre: 29.6 ± 2.8, post: 27.6 ± 2.4) and CON (pre: 34.7 ± 3.4, post: 31.1 ± 3.2) groups post-training. No significant main or interaction effects were found for TRAP5b or Bone ALP/TRAP5b ratio.
CONCLUSIONS: Bone ALP, a serum marker of bone formation, decreased following 12 weeks of BFR walking in college-aged women with no change in bone resorption. These findings are in contrast to past studies of BFR exercise in young and older men who reported either an increase in bone formation markers or a decrease in resorption markers. The discrepancy in findings between studies may be related to factors other than BFR exercise known to affect bone metabolism including energy availability, participant age, and seasonal effects.
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1068 Board #13 May 30, 9:00 AM - 10:30 AM

Footwear-specific Musculoskeletal Adaptations To A Bone-specific Exercise Intervention: A Comparison Of "Barefoot" And Regular Athletic Shoes

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(No relationships reported)

Lifelong physical activity is recommended to reduce the risk of osteoporotic fracture in old age. Exercises that induce high bone strains at rapid strain rates are most osteogenic. It is not known if skeletal adaptations to exercise training are modified by sporting footwear designed to attenuate loading. The lack of ability of modern sporting footwear to fully prevent injury, despite highly technical designs, has prompted renewed interest in barefoot running and the development of "barefoot" running shoes.
PURPOSE: To compare the lower extremity musculoskeletal response to an osteogenic training program between limbs wearing either a barefoot or regular running shoe.
METHODS: A within-subjects pilot exercise intervention was conducted. Previously sedentary individuals were randomly assigned one left or right "barefoot" and a matching regular athletic shoe in which they performed a 45-60 min graduated high impact exercise protocol 3-4 times per week for 6 months. Anthropometry and parameters of bone and muscle strength, including femoral neck bone mineral density, content, area and cross sectional moment of inertia, and lower extremity lean and fat mass (DXA, XR-800, Norland), tibial density at the 4% site, cortical thickness at the 38% site and muscle area at the 66% site (pQCT, XCT3000, Stratec) were measured at baseline and 6 months. The effects of training and shoe type were examined by 2-way ANOVA, controlling for age, weight, calcium and compliance.
RESULTS: Six young adults (4F, 2M, age 23 ± 2.4 years) volunteered to participate. All bone, muscle and fat parameters improved over the training period, except tibial density at the 4% site, with greater improvements in the barefoot limb; however, no effect reached statistical significance. A 4.5% increase in lower extremity lean mass (p=0.01) and 10.1% decrease in fat mass (p=0.002) was observed in the barefoot limb only.
CONCLUSIONS: Power was low in this pilot trial, thus positive footwear-specific skeletal responses to the osteogenic training program did not reach statistical significance. By contrast, greater increases in lean mass and decreases in fat mass were detected in the lower extremity wearing the barefoot shoe during training. The novel within-subject design was an effective control of individual variation with no adverse effects.

1069 Board #14 May 30, 9:00 AM - 10:30 AM

Estrogen Receptor-alpha Genotype Affects Exercise-related Bone Density In Japanese Young Women

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(No relationships reported)

Osteoporosis is a systemic skeletal disease characterized by low density and fragile in bone. Estrogen is essential for mechanotransduction, and estrogen receptor alpfa (ER1) is one of genetic candidates for a prime regulator of bone metabolism.
PURPOSE: The purpose of this study was to assess the interactive effects of habitual exercise, calcium intake and ER1 gene polymorphisms on bone density in young women.
METHODS: 160 Japanese healthy young women (20-23 years old) were recruited in this study. Habitual exercise and nutrient intake were assessed using a questionnaire. Bone mass was measured by quantitative ultrasound measurement. The polymorphisms of ER1 at intron I (rs2234693 and rs9340799) was genotyped using the TaqMan probe-based SNP method.
RESULTS: The subjects with habitual exercise and high milk intake were significantly higher bone density than those with non-habitual exercise and low milk intake. The subjects with ER1 genotype CC of rs2234693 had lower bone density than those with ER1 genotype TT in non-habitual exercise group. Interestingly, the subjects with ER1 allele C, or both CT and AG of rs9340799 in the habitual exercise group had significantly higher bone density than those in the non-habitual exercise group although the subjects without ER1 allele C or both CT and AG were no significant bone density between the habitual exercise group and the non-habitual exercise group.
CONCLUSIONS: These results suggest that habitual exercise is more important for bone mass metabolism in young women carrying C allele and/or AG genotype in ER1 polymorphisms.
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1070 Board #15 May 30, 9:00 AM - 10:30 AM

Relationship Between The Sarcopenic Index, Body Composition and Muscular Strength in Breast Cancer Survivors

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Breast cancer survivors (BCS) encounter side effects from cancer treatments that negatively affect body composition, particularly muscle loss which may lead to sarcopenia. Additionally, this may result in osteosarcopenia, the concurrent loss of bone and muscle mass. Appendicular skeletal muscle adjusted by squared height (ASM index; kg/m2) has been used to define sarcopenia.
PURPOSE: To evaluate the relationships between the ASM index, strength, and total and regional bone mineral density (BMD) in BCS.
METHODS: Forty-four (60±9 yrs) BCS participated. Body composition and BMD of the total body, lumbar spine (L1-L4), hip (femur), radius, ulna and total forearm were measured by DXA. Upper and lower body strength was measured via one-repetition maximum (1RM) on chest press and leg extension machines. Handgrip (HG) strength was assessed using a HG dynamometer. The BCS were separated into two groups comprised of those that fell above (>) and below (<) the median ASM index of 6.39 kg/m2. ANOVA, Pearson product moment correlation, and multiple regressions were used to analyze the data. Significance was accepted at $p<0.05$.
RESULTS: Upper body 1RM (77.1±19.7 kg), and HG (51.2±6.2 kg) were significantly greater in the group > 6.39 kg/m2 than below (61.8±15.6 kg and 46.2±5.8 kg, respectively). All measures of BMD were significantly greater for the group > 6.39 kg/m2 (total body: >1.182±0.135 g/cm²; <:1.103±0.098 g/cm²; radius: >: 0.518±0.059 g/cm²; <: 0.474±0.065 g/cm²; ulna: >: 0.474±0.064 g/cm²; <: 0.428±0.057 g/cm²; total forearm: >: 0.499±0.059 g/cm²; <: 0.455±0.060 g/cm²; $p \leq 0.05$). Lumbar spine and hip BMD did not differ between groups. The ASM index was significantly associated with upper body strength (r=0.597), HG (r=0.459), as well as total (r=0.567), femur neck (r=0.596), femur (r=0.676), radius 33% (r=0.572), and forearm (r=0.629) BMD. After controlling for age, height, and fat mass, the ASM index was a significant positive predictor of average femoral neck BMD.
CONCLUSIONS: Our findings suggest that the upper body 1RM and HG tests may be cost effective and valid methods of assessing diminished muscle mass in BCS. In addition, the positive relationship between ASM index and BMD may further assist clinicians to identify individuals at risk for osteosarcopenia.