CONCLUSIONS: No association was observed between serum 25(OH)D levels and markers of bone health in non-weight bearing athletes. Lower body weight was associated with osteopenia or osteoporosis regardless of serum 25(OH)D level.

1131 Board #5 June 1, 3:15 PM - 5:15 PM

Tibia Bone Strain Distribution during Incremented Load Carriage

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(No relationships reported)

Habitual runners and military recruits often develop tibia stress fracture (TSF). Continuous repetitive impact loading is a risk factor of TSF. Load carriage is essential to basic training and results in high bone strain, which may elicit TSF. Common TSF sites are at distal (DT) and middle (MT) thirds of the tibia. However, it is unknown whether incremented load carriage results in high strains in these regions. Also, it is important to determine if past physical activity results in different strain distributions during load carriage.
PURPOSE: To examine the effect of incremented load carriage on tibia strain distribution.
METHODS: Forty recreational runners (n=20, 21±2 yr.) and basketball players (n=20, 21±2 yr.) completed four tasks: walking with 0kg, 15kg, 25kg, and 35kg loads. Each task was performed on a force treadmill at 1.67 m/s. Participants' tibia models from CT scans were combined with subject-specific musculoskeletal models for forward-dynamic simulations and finite element analyses. Strains of the tibia shaft were analyzed. One-way ANOVAs were performed. $\alpha = 0.05$.
RESULTS: Significant differences in strain distribution were found ($P<0.0001$). For the 15kg condition, peak compressive and shear strains were presented at the DT and the peak tensile strain was presented at the MT. Specifically, the means ± SEs of runner's peak bone strains were 840±2 μs, 562±2 μs, and 1255±3 μs in compression, tension, and shear, respectively. Ball players' peak bone strains were 803±2 μs, 519±2 μs, and 1185±3 μs in compression, tension, and shear, respectively. As load carriage was increased beyond 15kg, peak shear strain shifted toward the MT from the DT. In particular, this pattern of shear strain redistribution was observed at 25kg and 35kg levels for runners and ball players, respectively.
CONCLUSION: Load carriage results in high compressive and shear strains in the DT and high tensile strain in the MT. Incremented load carriage leads to a shift of peak shear strain from the DT to the MT. Ball players' tibias are resilient to load carriage with small strains exhibited and a delayed shift of the shear strain. This study supports the epidemiology that common TSF sites are at DT and MT. Preconditioning programs involved running may be less effective to prevent TSF than basketball. US ARMY #W81XWH-08-1-0587; #W81XWH-15-1-0006.

1132 Board #6 June 1, 3:15 PM - 5:15 PM

Eccentric Contractions Promote Osteoclast Activity in the Tibia

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(No relationships reported)

The notion that bone and muscle communicate at the biochemical and molecular levels in ways beyond simple mechanical interactions is leading to new insight into how bone and muscles work together to maintain health. We studied how injury in the skeletal muscle impacts bone remodeling.
PURPOSE: To determine osteoclast activity in the tibia following contraction-induced injury in the tibialis anterior muscle (TA).
METHODS: Using an established model, unilateral injury to the TA was induced by 15 lengthening contractions. Injury was confirmed by measuring changes in maximal dorsiflexor isometric torque before and after lengthening contractions. With the TA in situ, both tibias were harvested 2 or 7 days after injury, fixed, decalcified, paraffin embedded, and sectioned. We evaluated osteoclast number (Tartrate-resistant acid phosphatase staining) and assessed local muscle damage (labeling of cytoskeletal proteins). The contralateral, uninjured tibia served as a control.
RESULTS: Osteoclast number was similar at days 2 and 7 in injured tibia. Osteoclast number was markedly higher along the lateral surface of the diaphysis in injured tibia compared to control (osteoclast surface/bone surface ratios: 0.215 ± 0.03 in injured vs. 0.09 ± 0.02 control). At day 2, there was a localized loss of desmin labeling in muscle fibers adjacent to increased osteoclast activity.
CONCLUSIONS: Our results indicate a time-dependent metabolic change of bone resorption in response to forceful lengthening contractions, a model of muscle strain injury. Future experiments include dynamic histomorphometry to assess bone formation and detailed analysis of muscle and bone progenitor cell proliferation (e.g., Ki-67 labeling) and myokine release and activity (e.g., FGF-2, IGF-1 expression) in bone, muscle and/or the interface following eccentric injury. An understanding of underlying mechanisms is essential for developing targets for therapeutic interventions of musculoskeletal injury and disease.

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1133 Board #7 June 1, 3:15 PM - 5:15 PM

Do 6 Months Of Whole Body Vibration Training Improve Bone Mass Acquisition Of Adolescent Swimmers?

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(No relationships reported)

Whole body vibration (WBV) training has been suggested to be an effective type of training for improving bone mass.
PURPOSE: To determine the effects of WBV training on bone mass acquisition in adolescent swimmers.
METHODS: Sixty-four swimmers were followed over 8 months. Participants were divided in to two groups: The first group consisted of forty-one swimmers (14.2±1.8 y) who completed a WBV protocol 15 minutes of training 3 days per week during 6 months (WBV training increased each month starting with a peak acceleration of 3.6 g and ending at 11.6 during the last month) while continuing with their habitual water training (VIB). The second group consisted of twenty-three swimmers (15.0±2.2 y) who continued with their regular swimming training (SWI) (both groups performed an average of 10 hours per week of water training). Bone mineral density (BMD) and content (BMC) were measured longitudinally (8 months) by Dual Energy X-ray Absorptiometry at the whole body, lumbar spine and non-dominant hip. Analysis of covariance (ANCOVA) for repeated measures x2 (time) were performed to check differences within groups between pre and post intervention and to determine the effects of the intervention on BMD and BMC values adjusting by change in height and subtotal lean, initial age and final Tanner stage and calcium intake.
RESULTS: Six months of WBV training had little effect on bone mass, as no differences were found between VIB and SWI for absolute change or percentage change for BMD values. For BMC, VIB presented higher absolute and percentage changes in both trochanter (7% increase in VIB vs. 3% in SWI) and total hip (6% increase in VIB vs. 3% in SWI) than SWI, although there was no group by time interaction.

CONCLUSION: WBV training might entail minor benefits to BMC acquisition in adolescent swimmers. A minimum compliance of sixty percent was needed to improve BMC, which in the present study consisted of attending at least 2 of the 3 weekly days of training. Future studies using WBV should try to perform more sessions per week at higher intensities to determine if this type of training could be highly beneficial to bone or if other high-impact trainings might be more suitable to improve bone mass in this population.
Supported by the Spanish 'Ministerio de Ciencia e Innovación' 'Plan Nacional I+D+i 2008-2011 (Project DEP DEP2011-29093)

1134 Board #8 June 1, 3:15 PM - 5:15 PM

Sedentary Behavior is Negatively Associated with Hip Bone Mineralization in Youth with Prader-Willi Syndrome

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(No relationships reported)

Increased time in sedentary behavior (SED) negatively influences bone health in children. Youth with Prader-Willi Syndrome (PWS) engage in less ambulatory and high-intensity physical activity than their peers and prefer sedentary activities, possibly putting those with PWS at higher risk for fracture incidence and early onset of osteoporosis.
PURPOSE: To evaluate the relationship between SED and bone parameters in youth with PWS.
METHODS: Participants included 23 youth with PWS (age: 11.0 ± 2.0 y, height: 142.3 ± 11.3 cm, lean mass [LM]: 29.0 ± 10.4 kg). SED was measured via accelerometry for eight consecutive days. Bone mineral content (BMC), density (BMD) and BMD z-score (BMD_z) were measured at the hip and total body minus the head (body) by dual energy x-ray absorptiometry. Separate hierarchical regression models were completed for all bone parameters, SED (step 1) and select covariates (age [BMC models only], height and LM) added in step 2.
RESULTS: SED and covariates explained 79.6% and 51.2% of the variance in hip BMC and BMD, respectively ($p \leq 0.001$ for both). SED was a significant predictor of hip BMD when adjusted for covariates (step 1: β = -0.404, p = 0.056; step 2: β = -0.375, p = 0.026). SED was a significant predictor of hip BMD_z when adjusted for covariates (step 1: β = -0.520, p = 0.011; step 2: β = -0.484, p = 0.025), even when the model approached significance (p = 0.069). SED and covariates explained 63.3% and 66.6% of the variance in body BMC and BMD, respectively ($p \leq 0.001$ for both). However, SED was not a significant predictor of body BMC or BMD, even when controlling for covariates ($p > 0.050$ for all). SED and covariates did not explain a significant portion of the variance in body BMD_z ($p > 0.050$ for all). Height was a significant predictor of hip and body BMC (β = 0.542, β = 0.753, respectively; p = 0.001 for both). LM was a significant predictor of hip and body BMD (β = 0.558, β = 0.759, respectively; $p \leq 0.005$ for both).
CONCLUSION: LM explained most of the variance in BMD in this sample, indicating that muscle strengthening activities that build LM may benefit bone health in this population. SED was negatively associated with hip BMD and BMD_z, suggesting that reducing SED may benefit bone mineralization at the hip in youth with PWS.
Supported by USAMRAA Award W81XWH-09-1-0682

B-65 Thematic Poster - **Cardiovascular I**

Wednesday, June 1, 2016, 3:15 PM - 5:15 PM

Room: 109

1135 **Chair:** Jill N. Barnes. *University of Wisconsin-Madison, Madison, WI.*

(No relationships reported)

1136 Board #1 June 1, 3:15 PM - 5:15 PM

Left Ventricular Mechanics In Healthy Females Are Not Significantly Altered In Response To Isometric Handgrip

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(No relationships reported)

Left ventricular (LV) mechanics characterize myocardial deformation across the cardiac cycle and are sensitive to changes in cardiac load. Previous research in a predominantly male cohort showed reduced LV mechanics in an afterload challenge mediated by isometric hand grip (IHG). There are known differences between male and female cardiac structure and function; it is possible that LV mechanics in females may differ in IHG.
PURPOSE: To quantify LV mechanics in females during IHG.
METHODS: Healthy females (n=18, age 28±4 yrs) performed an IHG (30% maximal strength; 9±1 kg) for 5 min. Cardiac images were collected using echocardiography at REST, DURING and 5 min POST IHG and analyzed for longitudinal, circumferential and radial strain, rotation and twist. Blood pressure was measured continuously. Repeated measures ANOVA was used to detect significant differences.
RESULTS: Without significant change in heart rate or cardiac output, systolic blood pressure was significantly increased DURING IHG compared to REST and POST (SBP: 123±13 *vs.* 113±12 *vs.* 114±13 mmHg respectively, $P < 0.01$). Similarly, systemic vascular resistance was increased DURING IHG compared to REST measurements (2306±361 *vs.* 2125±312 dynes·sec·cm^{-5} $P < 0.01$, POST 2246±274 dynes·sec·cm^{-6}) confirming IHG augmented afterload. Except peak basal circumferential strain, there were no significant differences in LV mechanics from DURING to POST IHG (Table 1).