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Acute Effects Of Cyclic Limb Compressions on mRNA Expression Of Angiogenic Factors In Skeletal Muscle
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(No disclosure reported)

Muscle contraction and therapeutic application of external pneumatic limb compression produces cyclic deformations and changes in shear-stress in the vasculature embedded in skeletal muscle. These mechanical forces are well known stimuli for angiogenic growth factor release in skeletal muscle.

PURPOSE: We tested the hypothesis that acute application (150 min) of cyclic leg compressions in a rat model up-regulates factors involved in angiogenesis in skeletal muscle.

METHODS: To explore the impact of different pressures and frequency of compressions, rats were divided into 4 groups: 120mmHg (2s inflation/2s deflation), 200mmHg (2s inflation/2s cuff deflation), 120mmHg (4s inflation/16s deflation) and control (no intervention). Intermittent pneumatic compressions were achieved by cyclically inflating/deflating a small cuff wrapped around the rat calf using a cuff inflator unit (Hokanson E20, Bellevue, WA, USA). Blood flow and leg oxygenation (Study 1, n=17) and the mRNA expression (RT-PCR) of angiogenic mediators in the rat tibialis anterior (TA) muscle (Study 2, n=16) were assessed after a single bout of IPC.

RESULTS: In all three groups exposed to the intervention, a modest hyperemia (~37% above baseline) between compressions and a slight, non-significant increase in leg oxygen consumption (~30%) was observed during IPC. Compared to the control group, vascular endothelial growth factor (VEGF) and monocyte chemotactic protein-1 (MCP-1) mRNA increased significantly (p<0.05) only in the rats exposed to the higher frequency on compressions (2s/2s).

CONCLUSIONS: These findings show that application of intermittent leg compressions and the accompanying stretch/deformation of the vasculature as well as changes in leg hemodynamics augment the mRNA content of key angiogenic factors in skeletal muscle. Importantly, the magnitude of changes in mRNA expression appeared to be modulated by the frequency of compressions, such that a higher frequency evoked the most robust changes in VEGF and MCP-1.

Support: NIH Grants RR-18276, HL-36088 and ACSM Foundation Research Grant.

F-52 Free Communication/Slide - Body Composition

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(No disclosure reported)

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Body Composition and Peak VO2 in Major League Baseball Players: A Retrospective Study
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(No disclosure reported)

Major League Baseball (MLB) continues to be a popular national sport. While much attention has been given to performance issues, few studies have examined the physiological characteristics, fitness levels and training patterns of these professional athletes.

PURPOSE: The purposes of this study were to 1) describe the trends in height, weight, percent body fat (%BF), fat mass (FM), lean mass (LM), and peak VO2 scores of professional baseball players over a 17 year-period; and 2) to compare these characteristics by player position.

METHODS: We retrospectively examined the changes in body composition and VO2 scores of 838 MLB players (27.9 ± 4.9 yrs) between 1991 and 2007. Physiological characteristics of height, weight, %BF, and peak VO2 were collected during spring training physicals. The personnel and test procedures remained consistent over the 17 year period.

RESULTS: Between 1991 and 2007, overall, the players' total body weight increased from 93.7 kg ± 9.6 to 96.7 kg ± 8.8 (p < 0.01), LM increased from 81.3 kg ± 6.3 to 84.4 kg ± 6.6 (p<0.005), and peak VO2 increased from 50.9 ml/kg/min ± 5.6 to 55.6 ml/kg/min ± 7.0 (p<0.0001). By position, pitchers (1.9 m ± 0.1) were taller than all other positions (catchers: 1.8 m ± 0.1; outfielders: 1.8 m ± 0.07; infielders: 1.8 m ± 0.05; p < 0.0001). Pitchers were also heavier (96.6 kg ± 9.8) than outfielders (93.1 kg ± 9.2) and infielders (93.2 kg ± 8.3) (p<0.01). The %BF of pitchers was higher (13.1% ± 2.9) from outfielders (10.6% ± 2.3) and infielders (11.2% ± 2.7) (p < 0.0001). The %BF for catchers was also higher (12.5% ± 2.8) than outfielders (10.6% ± 2.3) and infielders (11.2% ± 2.7). Pitchers (12.7 kg ± 3.7) had the highest FM followed by catchers (11.9 kg ± 3.0), outfielders (10.5 kg ± 3.5) and infielders (10.0 kg ± 2.7).

CONCLUSIONS: Differences in total body weight, %BF, LM and peak VO2 were likely attributable, in part, to the type of play required for the various positions. In terms of planning conditioning programs, spring training physiological screening can help provide players with a baseline profile which may help them more effectively train to improve their body composition and aerobic capacity to meet the demands of their position. Further, screening data and descriptive physiological profiles can help establish benchmark standards for minor league players.

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Is Body Cell Mass Determinant For Cardiorespiratory Fitness In Male And Female Elite Basketball Players?
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(No disclosure reported)

PURPOSE: This study was designed to examine the association between the metabolically active cellular mass, i.e. body cell mass (BCM), with cardiorespiratory fitness (CRF) in male and female elite basketball junior players.

METHODS: Subjects were 22 basketball players, aged 16-17 years, from the Portuguese elite teams divided in two groups: 12 males [body weight (BW): 78.4±7.2 kg; height: 192.5±6.5 cm; VO_{2max}: 4864.4±296.0 mL/min; BCM: 37.6±3.0 kg] and 10 females (BW: 64.8±7.7 kg; height: 175.5±6.6 cm; VO_{2max}: 3196.9±317.3 mL/min; BCM: 26.9±2.7 kg). A model [BCM=LST-(ECF+ECS)] was used to calculate BCM, where LST is lean-soft tissue, ECF is extracellular fluids, and ECS is extracellular solids. Whole-body analysis by DXA (Hologic QDR-4500) was performed to estimate LST and ECS (calculated as 1.732xMineral Osseous) while bioelectrical impedance spectroscopy (Xitron 4200) was used to assess ECF. To assess CRF, a maximal graded exercise test protocol was performed on a treadmill using a variable speed and grade. Maximal oxygen uptake (VO_{2max}) was measured by a breath-by-breath system with a zircon O₂ analyser coupled to an open circuit spirometry system (Cosmed, Quark b2). All measurements were made

in the first week of the pre-season training period.

RESULTS: A positive association was found between BCM and $\text{VO}_{2\text{max}}$ in male players ($r=0.63$; $p=0.028$) which remained significant after controlling for BW and age ($r=0.68$; $p=0.030$). For females no associations were observed between BCM and $\text{VO}_{2\text{max}}$ ($r=0.097$; $p=0.791$) even when adjusting for age and BW ($r=0.097$; $p=0.819$).

CONCLUSIONS: These findings suggest that higher CRF values in males are related with a larger metabolically active component (i.e. BCM), even accounting for the potential effects of age and BW. Further research is needed to understand the underlying mechanisms of gender-related differences in the associations observed between CRF and BCM in basketball junior players of the Portuguese elite teams.

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Body Composition by Questionnaire: A Pilot Study

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(No disclosure reported)

Some methods of body composition analysis have questionable reliability and validity, may be difficult and/or costly to perform, may be poorly tolerated by participants, and may be excessively time consuming. These concerns could potentially be addressed by assessing body composition by questionnaire.

PURPOSE: The purpose of this study was to validate a new body composition questionnaire using criterion results from Dual Energy X-ray Absorptiometry (DEXA).

METHODS: A sample of 29 adults (15 male and 14 female) between the ages of 19 and 26 years of age volunteered as participants. Each was evaluated with DEXA and a web-based questionnaire for percent body fat (PF). Stepwise regression analysis was performed between criterion and prediction BF values. The intraclass reliability of the questionnaire was established by comparing same-day test and re-test BF results. All data were analyzed with SPSS 16.0.

RESULTS: Stepwise regression analysis results for men and women are presented in table 1. The intraclass reliability coefficient for same-day test-retest BF results from the questionnaire was .998.

Table 1. Comparisons between predicted and criterion measures of body composition.

Percent fat	R	R ²	Adjusted R ²	SEE
Men	.725	.525	.486	4.77%
Women	.914	.836	.787	3.15%

CONCLUSIONS: The results indicate that the questionnaire had moderate to excellent measures of validity when compared with DEXA. Moreover, the questionnaire was quick (about five minutes per subject), reliable, easily performed, and well tolerated by participants.

It is recommended that future research with this method involve larger samples from multiple populations. It is further recommended that interactions between variables and the influence of misrepresenting data (intentionally or otherwise) be evaluated.

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Utility of Peripheral Quantitative Computed Tomography for Assessment of Regional and Total Body Fat in Girls

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PURPOSE: Peripheral quantitative computed tomography (pQCT) is a novel tool for assessing bone geometry and volumetric density. However, whether pQCT provides accurate measures of adipose tissue remains unclear. Thus, our aim was to compare adiposity in girls measured by pQCT and dual energy X-ray absorptiometry (DEXA), an accepted criterion method.

METHODS: DXA total body and pQCT scans of the non-dominant 20% distal femur and 66% distal tibia were performed on 415 girls (aged 8-13 yrs). Four cm regions of interest (ROIs) were drawn on each DXA scan at the pQCT sites of the non-dominant leg. Total cross-sectional area (CSA) and fat CSA were assessed at the 20% femur and 66% tibia and were used to compute pQCT percent fat. Pearson's correlations and multiple linear regression analyses were used to examine the relationships among percent (%) fat derived from DXA and pQCT. Ethnicity and maturity were included in regression models as covariates.

RESULTS: The sample was 87% white and 63% were Tanner stage 1 or 2. Mean BMI was $18.6 \pm 3.4 \text{ kg/m}^2$ ($12.4\text{-}32.1 \text{ kg/m}^2$) and DXA-derived total % body fat (BF) was 27.7 ± 8.6 (8.5-50.9%). pQCT % fat was highly correlated ($r = 0.86\text{-}0.91$, $P < 0.001$) with total % BF from DXA. %BF from DXA ROIs were consistently lower ($P < 0.001$) than pQCT % fat (20% femur, $37.3 \pm 7.8\%$ versus $51.8 \pm 6.5\%$; 66% tibia, $25.1 \pm 8.1\%$ versus $42.3 \pm 5.5\%$), but were highly correlated ($r = 0.88\text{-}0.95$, $P < 0.001$). Regression analyses showed that pQCT indices of adiposity were significantly ($P < 0.001$) and independently associated with DXA total % BF. pQCT % fat at the 20% femur explained 78% of the variance of DXA total % BF (adjusted $R^2 = 0.88$, $\text{SEE} = 2.96$), while pQCT % fat at the 66% tibia accounted for 69% of the variance of DXA total % BF (adjusted $R^2 = 0.79$, $\text{SEE} = 3.91$). At the 20% femur, pQCT % BF explained 90% of the variance of DXA ROI % BF (adjusted $R^2 = 0.91$, $\text{SEE} = 2.30$), while at tibia 66%, pQCT % BF explained 74% of the variance of DXA ROI % BF (adjusted $R^2 = 0.78$, $\text{SEE} = 3.77$).

CONCLUSIONS: pQCT indices of adiposity are highly associated with DXA-derived total body and regional percent fat, although pQCT is a better predictor of regional than total % BF. Thus, in addition to its accurate assessment of bone parameters, pQCT is a useful tool for estimating regional body fat.

Supported by NIH Grant: HD050775.

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Postmenopausal African American Women Demonstrate Greater Age-Associated Declines in Lean Tissue Mass Compared to Caucasians

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(No disclosure reported)

Aging is associated with a decline in lean tissue mass (LM). African American (AA) postmenopausal women have higher LM than Caucasians (C). We hypothesized that due to their higher LM, AA women would demonstrate an accelerated decline in LM compared to age-matched C subjects, and the decline in LM would be related to deconditioning (Lower Peak VO_2).

PURPOSE: To compare the rate of decline in lean body mass with age between postmenopausal AA and C women, and determine if peak VO_2 is related to the decline in LM.

METHODS: 226 C and 89 AA women of comparable age (58 ± 7 vs. 60 ± 7 yrs, respectively) had total LM and appendicular tissue mass (AM) measured by Dual Energy X-ray Absorptiometry (DEXA). Peak VO_2 (ml/kg/min) was measured during a progressive graded exercise treadmill test to exhaustion. Group differences were analyzed by Student's t-tests, and relationships were analyzed using Linear Regression. Data are mean \pm standard deviation.