D-18 Free Communication/Slide - **Loading and Unloading**

Thursday, June 2, 2016, 1:00 PM - 3:00 PM
Room: 313

1807 **Chair:** Stephen P. Messier, FACSM. *Wake Forest University, Winston-Salem, NC.*
(No relationships reported)

1808 June 2, 1:00 PM - 1:15 PM

Cardiorespiratory Fitness, Adiposity Or Muscular Strength- The Best Predictor For Gait Biomechanics In Obese Children?

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Obese children may find it difficult to perform physical activity for a variety of reasons, including low cardiorespiratory fitness, decreased strength and increased joint moments but the relationships among these variables have not been previously investigated.
PURPOSE: To explore the effect of including measures of cardiorespiratory fitness, adiposity and muscular strength in predicting gait biomechanics in obese children.
METHODS: Twenty nine children, 14 girls and 15 boys, mean age 9.8±0.9 years, mean BMI 27.06±3.2 kg/m2 and mean BMI percentile 96.1±4.1, were recruited from University of Iowa Obesity Clinics. The 15 m Progressive Aerobic Cardiovascular Endurance Run (PACER) protocol was used to estimate cardiorespiratory fitness (V̇O2max). Adiposity measured as percent body fat, was estimated by air displacement plethysmography (Bod Pod). Right lower limb isometric strength was assessed using a custom leg press device. Intra-red emitting markers were applied to lower limbs, pelvis, and trunk segments to generate subject specific biomechanical anatomical models of walking gait on an 8 m walkway using a 3D motion analysis system (Optotrak, Kistler). Peak hip and knee moments normalized to body weight for the right side were analyzed for five walking gait cycles. Step wise regression model included moments as dependent variable and fitness, adiposity and right lower limb strength, as the three independent variables. P-value <0.05 was considered significant.
RESULTS: Mean aerobic fitness as estimated by PACER was low (34.1±6.0 mL·min-1·kg-1). Mean adiposity was 32.2±7.6 % body fat and mean right lower limb strength, was 7.54±2.29 N/kg. The step-wise regression model for hip and knee adductor moments included adiposity as the only predictor variable (adjusted R2=0.3 and 0.22 respectively). Knee extensor moments selected both strength and adiposity as the predictor variables (adjusted R2=0.35) whereas hip extensor moments did not include any variable. None of the step-wise models included cardiorespiratory fitness.
CONCLUSION: Adiposity was the main factor in models for adduction moments, whereas adiposity and knee strength correlated with knee extensor moments. The result suggests that level of adiposity and strength may be important factors in predicting gait biomechanics in obese children.

1809 June 2, 1:15 PM - 1:30 PM

Obesity Increases Joint Moments Relative to Available Strength During Gait

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Lower extremity joint moments during gait are higher among obese individuals compared to non-obese individuals. However, because obese individuals also exhibit greater lower extremity strength, it is unclear if these joint moments are higher relative to available strength.
PURPOSE: To investigate the effects of obesity on lower extremity joint moments during gait, expressed relative to available strength.
METHODS: Participants included 19 obese (body mass index, or BMI >=30.0 kg/m^2) adults and 20 normal-weight (19 kg/m^2<BMI<=25 kg/m^2) adults. Sagittal plane, lower extremity joint moments were determined during gait at a self-selected speed using an inverse dynamics analysis. Maximum voluntary isometric capacity (MVIC) was assessed at the hip, knee, and ankle in flexion and extension. Joint moments were normalized to MVICs, and compared between groups using a two-way ANCOVA with gait speed and leisure-time activity level as covariates.
RESULTS: Obese participants used 52% higher normalized knee extensor moments during weight acceptance (p<0.05), and 55% higher normalized ankle plantar flexor moments during push off (p<0.05). No other differences in normalized joint moments were found between obesity groups.
CONCLUSIONS: The higher joint moments at the knee and ankle relative to available strength could help explain gait limitations present among obese individuals.

1810 June 2, 1:30 PM - 1:45 PM

The Effect of Added Weight on Foot Anthropometry in Pregnant Women and Controls

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Foot anthropometry is altered by pregnancy, but it is not known if these changes are due to increased weight or hormonal effects of pregnancy on the body.
PURPOSE: The purpose of this study was to examine the effect of added weight on foot anthropometry in pregnant women and never-pregnant controls.
METHODS: Fifteen primigravid women and 13 nulliparous controls participated. Controls were matched to the pregnant women based on the pregnant women's self-reported pre-pregnancy weight. Informed consent was obtained. Data were collected on the pregnant subjects in each trimester and post-partum. Foot length, foot width, arch index, arch height index, arch rigidity index, and arch drop were assessed. To determine the effect of added weight on foot anthropometry, pregnant subjects in their first two trimesters donned a weighted pack on the anterior trunk such that total weight difference from pre-pregnancy weight was 124N, which was based on data from a previous study. Foot measurements were then repeated while the subjects wore this pack. Third trimester subjects did not wear a pack as they were at full-pregnancy weight. For post-partum subjects, their body weight plus the weight of the pack equaled their third trimester weight. For control subjects, their body weight plus the weight of the pack equaled the third trimester weight of the pregnant subject to whom they were matched. A MANOVA was performed with the independent variables of trimester (control, 1st, 2nd, 3rd, and post-partum) and weight condition (natural or weighted). Tukey post-hoc analyses were performed if appropriate (α=0.05).
RESULTS: Arch drop increased by 18% (p=0.001) and arch rigidity index decreased by 1% (p=0.002) in the weighted condition compared to the natural condition. Increase in foot length and width and decrease in AHI with added weight was greater in pregnant subjects vs controls, with the change increasing over the course of the pregnancy. (p<0.05).