



Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 1st – 2nd, 2019
Conference Proceedings

International Journal of Exercise Science, Volume 9, Issue 8



Load Magnitude and Locomotion Strategy Alters Knee Mechanics in Recruit-Aged Women

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Female soldiers experience a greater incidence of Knee Osteoarthritis (OA). A proposed mechanism of OA is ruck marching, involving load carriage at a fast pace. Knee Total Joint Moment (KTJM) and changes of percent (%) contribution in each plane of motion moment has been linked to OA. **PURPOSE:** To determine the interactive effects of load magnitude and locomotion on KTJM % contribution in women. **METHODS:** Twelve healthy females (Age: 24.75 ± 2.17 y) completed 3 testing sessions collecting kinematic and kinetic data. Subjects wore combat boots and weighted vest. Trials were conducted at body weight (BW), and loaded; +25%, +45%. At each load, 2 locomotion types (running [RN] and forced march [FM]) were performed at +10% above their gait transition velocity were performed. KTJM was calculated utilizing Euclidian norm with % contribution derived from KTJM for each plane: Knee Flexion (KF%), Adduction (KA%), and Rotation (KR%), and normalized to system weight. Multifactorial RMANOVA, load by locomotion (3x2), were conducted on Heel strike [HS] and Midstance [MS] data for each plane. Bonferroni-corrected pairwise comparisons were conducted when necessary ($\alpha=p<.05$). **RESULTS:** KF% at HS there was an interaction ($p<.05$). Simple main effect of load ($p<.02$) during RN; +25% ($p<.02$) and +45% ($p<.01$) greater than BW. No simple main effect of load for FM. There was a main effect of locomotion ($p=.006$), with RN ($64.9 \pm 4.8\%$) greater than FM ($49.8 \pm 2.7\%$). KF% at MS, there was an interaction ($p=.02$); RN was greater than FM at all load conditions ($p<.04$). KA% at HS, there was no interaction ($p=.09$). There was a main effect of load ($p=.01$); BW greater than +25% ($p=.03$). KA% at MS there was no interaction ($p=.31$). There was a main effect of locomotion ($p=.003$), with FM ($43.8 \pm 3.1\%$) greater than RN ($29.9 \pm 4.1\%$). No significant findings for KR%. **CONCLUSION:** At HS as load increased KF% increased for the RN, demonstrating appropriate movement response to load increases where the individual relies more on knee flexors/extensors to absorb energy. No change in KF% between load conditions for FM demonstrates an inability to modulate movement to accommodate to changes in load. At MS, RN exhibited greater KF% than FM. Thus, the FM strategy promotes successful task execution over safe task execution even if increased KA% is a consequence, potentially predisposing to OA.