

Riemann, BL, Davies, GJ. Abstract presented at ACSM Annual Conference,
Indianapolis, IN, 2008

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Kinematic and Kinetic Analysis of the Forward Lunge During Four External Load Conditions: 2169: Board #140 May 30 8:00 AM - 9:30 AM

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(No relationships reported)

PURPOSE: To determine the effects of external load on ankle, knee and hip joint kinematics and kinetics during the forward lunge **METHODS:** Sixteen recreationally active college-aged adults (8 men, 8 women) completed forward lunges under four external load conditions, 0% (control), 12.5%, 25%, and 50% body mass, in a between-subject randomized order. Three dimensional kinematics and ground reaction force data were used to quantify ankle (AN), knee (KN) and hip (HI) kinematics, net joint extensor moment impulse (NJMI) and eccentric (ECC) and concentric (CON) work during the interval when the stepping limb (dominant limb) was in contact with the ground. Additionally, four lunge characteristics, repetition time, stepping limb contact time and vertical and anterior total body center of mass displacement, were calculated.

RESULTS: No significant ($P > .05$) condition effects were realized for the lunge characteristics or peak flexion angles. For NJMI, post hoc analyses of a significant condition by joint interaction ($P < .001$) revealed HI to be dominant across all conditions with $AN > KN$ for 25 and 50. The addition of weight had no significant effect on KN NJMI, while significant AN & HI NJMI increases were not evident until 25% body mass was added (0 & $12.5 < 25 < 50$). Similar to NJMI, a significant condition by joint interaction ($P < .001$) was revealed with the hip performing significantly greater work for both phases (ECC: $HI > AN$ and KN ; CON: $< HI > KN > AN$). Within joint comparisons revealed $AN \text{ CON} = \text{ECC}$, $KN \text{ CON} > \text{ECC}$, and $HI \text{ ECC} > \text{CON}$. Additionally, a significant phase by joint interaction ($P < .001$) was demonstrated with the hip producing approximately 50% of the total work across all conditions. Although the additional weight prompted significant work increases at the HI (0 & $12.5 < 25 < 50$) and AN ($00 < 50$) and no significant KN changes, the proportion of total work contributed by each joint remained nearly constant.

CONCLUSION: The forward lunge is HI extensor dominant exercise. The addition of external weight prompted no significant changes in KN NJMI or work. These results can assist clinicians in deciding whether the characteristics of the forward lunge match a patient exercise needs during rehabilitation and performance enhancement programs.