Gait in Controlled Ankle Movement (CAM) Walker Boot Using a Contralateral Shoe Lift

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INTRODUCTION: Walking mechanics play a fundamental role in daily mobility and are significantly influenced by footwear choices, particularly in individuals with lower limb conditions. Among the interventions commonly used in rehabilitation settings are controlled ankle movement (CAM) boots and shoe lifts, which aim to provide support and improve gait dynamics. The purpose of this outcome study was to test how different a person walks when wearing the controlled ankle movement (CAM) boot and the shoe lift compared to walking with your running shoes.

METHODS: We conducted a prospective cohort study of 30 participants, 15 men and women, who underwent three-level walking trials under the following conditions: athletic shoes, tall CAM boot, and tall CAM boot with a balancer added to the contralateral foot. A motion capture system was used to process biomechanical outputs using 16 markers placed on specific anatomical locations following the Plug-in Gait Body Model. Spatiotemporal variables (contact times, stride length, speed, time spent in stance/swing phases, cadence) and lower limb kinematics (knee and hip joint angles, movement, and forces) were analyzed. A Two-Way ANOVA identified significant effects of walking conditions and gender on various gait characteristics.

RESULTS: In both ipsilateral and contralateral limbs, cadence ($p < 0.001$ and $p = 0.012$) and step width ($p < 0.001$ and $p < 0.001$), along with walking speed ($p = 0.024$), single support time ($p < 0.001$), and step time ($p = 0.021$) in the contralateral limb, were significantly different under normal walking conditions compared to walking with the CAM boot and the combination of a shoe lift and CAM boot. For joint angles, the walking condition significantly affected contralateral limb hip abduction ($p = 0.038$), hip flexion ($p = 0.036$), and knee flexion ($p = 0.023$). Notably, the combination of a CAM boot and shoe lift restored these angles in the contralateral limb to those observed during normal walking, compared to walking with the CAM boot alone. Regarding kinetics, hip medial/lateral force ($p = 0.007$) and knee compression force ($p = 0.014$) in the contralateral limb returned to levels observed during normal walking when using the CAM boot and shoe lift, compared to walking with only the CAM boot.

DISCUSSION AND CONCLUSION: Our study demonstrates significant changes in gait patterns and lower limb biomechanics when individuals wear a controlled ankle movement (CAM) boot and a shoe lift compared to athletic shoes. These results underscore the importance of considering footwear interventions in clinical and rehabilitation settings, as they can substantially influence gait patterns and biomechanical dynamics; highlighting the need for careful consideration in clinical and rehabilitation settings.