

COMPARISON OF GAIT PERFORMANCE BY AN ADULT WITH OSTEOMYOPLASTIC TRANSTIBIAL LIMB LOSS AND ABLE-BODIED CONTROL

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Background: 75% of Americans with limb loss undergo transtibial limb amputation (TTA). Despite recent advances in post-operative care, 64.1% of those employable do not return to work or full community participation. However, those with osteomyoplastic TTA (OTTA) have been shown more likely to return to work and to the community. Gait patterns and functional performance have been studied to better understand barriers to long-term community participation, yet 3-D motion gait comparison at 2 speeds by an adult with OTTA and a matched control has yet to be studied.

Purpose: The purpose of this case study was to compare kinetic, kinematic, and spatiotemporal parameters of gait performance at self-paced (SP) and brisk (BP) speeds by an otherwise healthy adult with OTTA and an able-bodied control.

Methods: Retrospective cross-sectional case comparison data of 2 men (one with right OTTA[R-OTTA], one control matched by age, sex, height and weight) were from an unpublished prospective cohort study. Participants' 3-dimensional gait performance at SP and BP speeds was captured using Qualisys™ Motion Analysis System and AMTI™ force plates. Visual 3D™ software was utilized to analyze integrated, normalized gait data and produce kinetic (ground reaction force=GRF), kinematic (movement [ROM] at hips, knees, ankles) and spatiotemporal (gait speed, step length, time in double support) reports.

Results: Kinetics: GRF production was similar between participants except for OTTA GRF was produced 5% later on the right prosthetic side during stance at SP speed and was greater on *left* intact-side by 3 N/Kg, notably at BP speed. Kinematics: The R-OTTA demonstrated less right hip sagittal ROM at SP and BP speeds by 20 deg, more right knee sagittal ROM by 20-30 deg; less right prosthetic ankle movement by 50 deg; and greater *left* subtalar transverse eversion by 20 deg. Spatiotemporal: SP gait speed was nearly identical between participants (0.001m/s), however, OTTA BP speed was 0.1 m/s faster. Step length was essentially identical between participants at SP and BP speeds, except for the OTTA right prosthetic limb was greater by 0.1 m and with greater STD by ± 0.02 in SP and ± 0.07 m in BP. Times in double support for the OTTA participant were greater by 0.010s in SP and 0.001s in BP.

Discussion/Conclusions: Comparisons show all of the measured gait characteristics were similar except for greater OTTA BP walking speed, right OTTA knee range of motion, and considerably greater left ankle eversion on the OTTA intact limb. Delay in R-OTTA GRF production during stance may reflect energy-storing properties of the prosthesis.

Relevance to Allied Health: A man with OTTA is able to walk at similar-to-faster gait speeds than a matched able-bodied control, but with increased range of motion at the residuum knee and at the intact ankle. This case comparison study demonstrates possible biomechanical compensation and injury risk during gait performance and gives evidence to inform clinical intervention and future study.