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Work performance measures in men with trans-tibial amputation due to trauma

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Abstract

Most with trans-tibial amputation due to trauma (TTAT) are work-eligible, yet disproportionately unemployed. Contributing mechanisms to employment-ending injury are inappropriate weight-bearing load distribution at the residuum-prosthetic socket interface (RPI), residuum muscle activity during active prosthetic use or increased tissue vulnerability to biomechanical injury. This cross-sectional pilot examined RPI loads, residuum muscle activity, and (bone loss, inflammation) biomarker levels in 10 healthy men with unilateral TTAT and 30 controls. Force sensors were attached at 12 sites within prosthetic sockets. Accelerometers and EMG sensors were placed on intact limbs and residua of participants with TTAT and controls' lower extremities that corresponded to the quadriceps, anterior tibialis, and gastrocnemius, recording self-paced and brisk walking distance (2MWT), floor-to-knuckle lifting, and 25-ft carrying. TTAT and control participants were similar in age, height, weight, and employment. 6 controls tested positive for bone vulnerability (BAP). One with TTAT tested positive for inflammation (CRP). The TTAT group (9 osteomyoplastic, 1 standard TTAT) demonstrated lower carry (56.5lb, $p<.01$) and lift (62.0lb, $p< .05$) capacities than controls (68.5lb; 78.3lb). Self-paced and brisk 2MWT distances were similar between groups ($F=.704$, $p=.405$; $F=2.330$, $p=.134$). Load was greatest at the anterior-distal RPI. In stance: RPI load pattern and amplitude during self-paced and brisk gaits were similar overall; amplitude was greatest during carrying; residuum quadriceps and anterior tibialis activity was less, yet uniquely characteristic, during self-paced and brisk walking and carrying. Inverse relationship exists between osteomyoplastic residua and intact/ control limbs in gastrocnemius activation during stance. Little-to-no activity was recorded in standard TTAT residuum.

Biography

Dionne received her BS in Physical Therapy from University at Buffalo, MS in Education from Syracuse University, a DPT from Arizona School of Health Sciences, and PhD in Physical Therapy from Texas Woman's University. She is a tenured Associate Professor in Rehabilitation Sciences and Director of the Mechanical Therapy Research Lab at the University of Oklahoma Health Sciences Center. She has authored more than 40 peer-reviewed publications and innumerable presentations; is serving currently on the Board of Directors at NCOPE and as a Content Expert for the American Board of Physical Therapy Specialties.