

## **Muscle Activity and Ground Reaction Forces in Unilateral Transtibial Amputees**

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**Purpose:** There are nearly 2-million people in the United States living with limb loss. Dysvascular disease is the most common cause of lower limb amputation, with 71% resulting in below knee amputations (BKA). Individuals with BKA have abnormal ground reaction forces (GRF), and demonstrate decrease weight bearing on the prosthetic limb. The purpose of this study is to examine the differences in proximal hip muscle activity and ground reaction forces during the stance phase of gait in unilateral adult with below knee amputations.

**Methods:** Five adults with unilateral BKA (age:  $51.2 \pm 14$  years, height:  $178.3 \pm 14.3$ cm, weight:  $94.66 \pm 15.29$ kg, BMI:  $30.04 \pm 6.1$  kg/m<sup>2</sup>, age of the implant was  $16.6 \pm 9.44$  years) were recruited for this study. Data was collected in the Fresno State Gait Analysis Movement Evaluation (GAME) lab. Ground reaction forces were collected during five gait trials. EMG analysis of the bilateral gluteus maximus and gluteus medius musculature were also recorded during gait trials.

**Results:** Adults with BKA's have trends suggesting decreased muscle activity during gait. Additionally, there are weight bearing asymmetries that favor their intact limb with differences during heel strike and toe-off in the anterior-posterior and vertical GRF's. There is a high correlation between muscle activity and asymmetrical weight bearing on the prosthetic limb.

**Discussion:** Gait asymmetries in adults with unilateral BKA's can lead to increased risk of developing OA on the intact limb. Decreased economy of gait in adult BKA's can cause increased caloric expenditure. If there is asymmetrical muscle strength it can be assumed there will also be asymmetrical GRF's in the anterior-posterior and vertical planes through the prosthetic limb. Clinicians can use this information to address these asymmetries.