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Ground-Reaction Forces and Spatiotemporal Parameters during Self-Selected Gait Speed in Adults with Lower Limb Amputation

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Abstract:
2 million individuals in the United States are living with limb loss and approximately 65% are lower-limb amputation (LLA). In 2009 it was estimated that annual healthcare costs for those with amputation were more than $8 million. As a result of LLA individuals demonstrate gait impairments including spatiotemporal and biomechanical differences. Following LLA gait and physical mobility requires increased metabolic energy during the performance functional tasks when compared to healthy individuals. In general, physical mobility and overall physical activity levels are significantly lower compared to healthy individuals. As a result, individuals with limb loss have higher morbidity and mortality rates. Limited physical mobility is a barrier thus affecting overall quality of life. As a result, individuals may experience a cycle of weight gain, increased chronic pain complaints, and isolation within their homes. Immobility leads to a host of health-related consequences and/or can increase the severity of existing comorbidities such as cardiovascular disease, peripheral vascular disease, metabolic syndrome, obesity, and diabetes. Individuals that have undergone limb loss have an increased risk of death in the first year following surgery. In addition, those with LLA also have an increased risk for repeat surgeries and further amputation within the same lower limb or the uninvolved limb. Osteoarthritis (OA) in the remaining lower limb or the uninvolved limb is another problem

commonly seen in individuals with LLA. Amputation effects joint forces and a common problem seen in this population is OA at the hip and/or knee. OA occurs as a result of increased ground reaction forces (GRF) during the gait cycle increasing joint reaction forces (JRF) at this hip and/or knee. The purpose of this long-term study is to analyze biomechanical and spatiotemporal forces during the gait cycle in adults with lower limb amputation using the Prokinetcis Zeno Walkway gait analysis mat and 3D ground-reaction forces (GRF) using the Kistler Force Platform.