

NON -TECHNICAL ABSTRACT: *(State in layman's terms the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project for California.)*

Based on a study reported in 2005, there were approximately 1.6 million people living in the United States with limb loss with a projected increase to 3.6 million by the year 2050. Major lower limb amputation accounted for over 30% of the total number of amputees. Specifically to veteran health, over 12,900 veterans have below-knee amputation performed within all VA facilities between 2000 and 2008. Among lower-limb amputation, extensive research has been performed on the gait characteristics and prosthetic management for unilateral amputation. However, there is limited research on quantitative data involving the gait characteristics in bilateral lower-limb amputees. Current alignment and componentry guidelines for bilateral prostheses are generally based on clinical intuition or guidelines developed for unilateral patients. In this work, we propose to conduct a human subject experiment and develop computational methods to analyze the gait of bilateral transtibial (below-knee) amputees and quantify the key differences (or similarities) to the gait characteristics of unilateral transtibial amputees. In addition, the study will also investigate variations in common practices in prosthetic fitting, specifically the adjustment of the prosthetic foot size, foot rotation, and base support distance, on the rehabilitation outcome. Our research findings can lead to a better understanding of bilateral amputee gait patterns and improved prosthetic design and fitting procedure that can enhance the quality of patient care and assist the patients toward becoming prosthetically rehabilitated.