Extremity Trauma Rehabilitation and Treatment

Novel Rehabilitation Strategies

The Extremity Trauma and Amputation Center of Excellence (EACE) continues to conduct investigations with resulting publications in the area of perturbation-based gait training in a virtual environment. Roughly 50 percent of individuals with lower limb amputation report a fear of falling and fall at least once a year. Perturbation-based gait training in a challenging simulated environment shows promise for improving walking stability and incorporation into a rehabilitation program. Perturbation-based gait training and the use of virtual environments have been shown independently to be effective at improving walking stability in patient populations. An intervention was developed combining the strengths of the two paradigms utilizing continuous, walking surface angle oscillations within a virtual environment. One published case report describes walking function and mediolateral stability outcomes of an individual with a unilateral transfemoral amputation following a novel perturbation-based gait training intervention in a virtual environment.1 Perturbation-based gait training in a challenging simulated environment shows promise for improving walking stability and incorporation into a rehabilitation program. This intervention has been implemented clinically, and researchers are exploring additional uses of virtual reality to challenge and assess stability. An additional study systematically determined the between-session reliability and minimum detectable change values of temporal-spatial, kinematic variability, and dynamic stability measures during three types of perturbed gait.2 Twenty young healthy adults completed two identical testing sessions two weeks apart, comprised of an unperturbed and three perturbed (cognitive, physical, and visual) walking conditions in a virtual reality environment. Temporal-spatial, kinematic variability, and dynamic stability measures collected during perturbation-based assessment paradigms are often used to identify dysfunction associated with gait instability. However, it remains unclear which measures are most reliable for detecting and tracking responses to perturbations. This study found that across all perturbation types, temporal-spatial, orbital and local measures were the most reliable measures with the lowest minimum detectable change values, supporting their use for tracking changes over multiple testing sessions. This intervention has been implemented clinically and researchers are exploring additional uses of virtual reality to challenge and assess stability (Figure 1 and Figure 2).

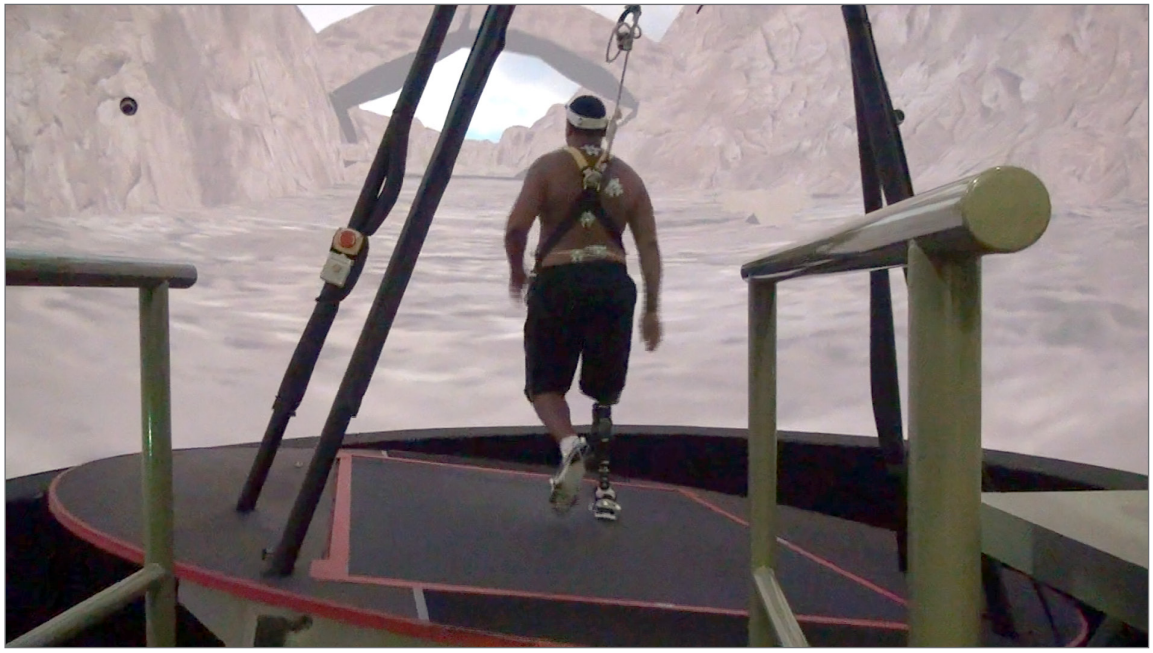

FIGURE 1: Individual with a transfemoral amputation participating in a perturbation-based, gait training protocol within the virtual reality environment at Brooke Army Medical Center's Center for the Intrepid. Picture courtesy of Dr. Riley C. Sheehan.

FIGURE 2: Individual utilizing the Intrepid Dynamic Exoskeletal Orthosis, following limb trauma, to complete a simulated combat patrol task within the virtual reality environment at Brooke Army Medical Center's Center for the Intrepid. Picture courtesy of Dr. Christopher A. Rábago.