



US DEPARTMENT OF DEFENSE

BLAST INJURY RESEARCH PROGRAM COORDINATING OFFICE

Extremity Trauma Rehabilitation and Treatment Advanced Prosthetics and Orthotics

Extremity Trauma and Amputation Center of Excellence (EACE) researchers published results on the effects of ankle-foot orthosis (AFO) design on stair climbing mechanics.¹ The study examined both stair ascent and descent for Intrepid Dynamic Exoskeleton Orthosis (IDEO®) users and able bodied control participants. Reduced ankle range of motion and power on the IDEO® limb resulted in compensatory strategies to include greater bilateral hip power during stair ascent and large vertical ground reaction forces, and ankle and knee power absorption on the sound limb during descent. Studies such as this are important to improve the design and function of AFOs as well as contributing to the body of research to support clinical use and prescriptive criteria of specific orthotic devices. Another EACE study evaluated how experienced prosthesis users descended a slope using either an X2® or conventional knee (either mechanical or microprocessor).² Gait was more symmetrical and generally improved when wearing the X2® knee compared to a conventional knee and handrails were used less frequently. These findings suggest greater confidence in balance and walking abilities in the X2® prosthesis and contribute to the evidence to support clinical prescription. The ability to navigate stairs step-over-step is an important functional outcome following severe lower leg injury and is difficult for many patients. Despite gait deviations, IDEO® users were able to climb stairs step-over-step unassisted. Both of the studies contribute to evidence supporting clinical prescription of advanced prosthetic and orthotic devices.

- 1 Aldridge Whitehead, J. M., Russell Esposito, E., & Wilken, J. M. (2016). Stair ascent and descent biomechanical adaptations while using a custom ankle- foot orthosis. *Journal of Biomechanics*, 49(13), 2899– 2908. <https://doi.org/10.1016/j.jbiomech.2016.06.035>
- 2 Bell, E. M., Pruziner, A. L., Wilken, J. M., & Wolf, E. J. (2016). Performance of conventional and X2(R) prosthetic knees during slope descent. *Clinical Biomechanics (Bristol, Avon)*, 33, 26–31. <https://doi.org/10.1016/j.clinbiomech.2016.01.008>

