



US DEPARTMENT OF DEFENSE
BLAST INJURY RESEARCH PROGRAM
COORDINATING OFFICE

Pain Management and Rehabilitation after Amputation Virtual Reality Therapies for Phantom Limb Pain

Amputation may result in a variety of unintended side effects, including PLP. The perceived ability to move the phantom limb is related to pain severity; previous work using the illusion of an intact limb has resulted in reduced PLP. A research team at CRSR at USUHS presented four of their studies on VR therapies for PLP at the 8th Congress of the European Federation of the International Association for the Study of Pain Chapters in October 2013. The first study assessed the efficacy of combining “motor training” of the phantom limb with virtual feedback to alleviate PLP. After training twice a week for 8 weeks, five of eight participants reported > 30% pain reduction. The second study developed an immersive VR environment in which motions of an amputee’s intact limb were tracked and transposed onto a computer-generated representation of the individual’s phantom limb in the virtual environment. Four participants reported a tangible reduction in pain, two gained some control over their phantom limb’s maneuverability, and one was even able to exercise some control over the residual limb, which had been paralyzed for over 12 years. The third study developed a novel variation on the mirror box treatment; motion data from a patient’s residual limb were captured and transformed into goal-directed, virtual action enacted by an avatar in a VR environment. In a preliminary sample of 14 individuals (seven with arm and seven with leg amputations), 10 felt the virtual limb moved as their own and reported reductions in PLP that were greater than would be expected from the performance of a distraction task alone. The fourth study used the virtual integrated environment (VIE) developed by JHU/APL. Participants using the VIE were able to train and complete a full range of virtual arm motions over the course of twenty 30-min sessions. Five of the six participants reported that using the VIE alleviated PLP. Collectively, these studies use a variety of VR techniques for the treatment of PLP across diverse rehabilitation populations.