Program Highlight
Wheelchair Technology

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In 1980, a young U.S. Army soldier stationed in Germany injured his spinal cord in a bicycle accident. During his recovery, the soldier was given a bulky and heavy wheelchair to use, which greatly limited his mobility, especially when he tried to take part in competitive wheelchair athletics. The soldier, whose name was Rory Cooper, immediately realized there was a great deal of room for improvement in wheelchair design. He has dedicated the rest of his life to making those improvements.

After receiving his PhD, Cooper established a Human Engineering Laboratory at California State University in Sacramento, where he did extensive research in wheelchair design and use. In 1993, he was recruited to join the faculty of the School of Health and Rehabilitation Services at the University of Pittsburgh, with the mission of linking the University with its VA affiliate, the VA Pittsburgh Healthcare System.

He moved his laboratory to VA Pittsburgh's Highland Drive Division, where it was renamed the Human Engineering Research Laboratories (HERL) in 1994. The laboratory began with one VA merit review grant, one lab area, two graduate students, and one staff person besides Cooper and Dr. Michael Boninger, the lab's first and only medical director. Today, the Laboratories conduct more than 74 active clinical studies in eight laboratories with a staff of more than 50 people, including engineers, physicians, therapists, research specialists, and more than two dozen outstanding graduate students and medical interns studying rehabilitation.

HERL's mission is to continually improve the mobility and function of Veterans with disabilities through advancing engineering and clinical research in medical rehabilitation. Its eight laboratories occupy more than 15,000 square feet, and feature state-of-the-art research instruments and machines. The lab holds about a dozen patents, with six other inventions in use through licensing agreements.

Among the organization's many projects is the development of an electric powered system to help wheelchair users with limited hand function, called a Personal Mobility and Manipulation Appliance (PerMMA). Simply put, it's a power wheelchair fitted with robotic arms to help wheelchair users with limited hand function to propel themselves. Besides

propulsion, users will be able to use the arms to do a range of everyday tasks, such as taking food out of the refrigerator and heating it in a microwave or picking up a book from across a table. The arms can also be used by remote control.

At present, the arms are controlled not by the user, but by a helper at a remote location; however, a range of technologies are being explored to extend full control to the person in the wheelchair. These include voice activation, responding to light touch, and a brain-computer interface that would enable users to control the arms directly with their thoughts.

For Veterans with traumatic brain injuries, HERL has developed a modular wall system that enables the user to control the lights, appliances, temperature, doors and entertainment systems within his or her home via remote control. The system can be built within existing homes and in new construction, and customized to fit the individual needs of Veterans with various types of injuries.

At VA's 2010 National Veterans Wheelchair Games. HERL unveiled a new type of "throwing chair," designed with input by athletes who are also wheelchair users. The chair is built for athletes competing in throwing events such as shot put, discus and javelin in fully seated to partially standing positions and using various throwing strategies. Every year at the games, which will be held in Pittsburgh in 2011, HERL interacts with Veterans who use wheelchairs, disseminates research results, educates wheelchair users on their work, and recruits people who use wheelchairs and live outside of the Pittsburgh area to participate in research studies.

"Our goal to improve the lives of people with disabilities includes not only research, but also research training, dissemination of information, and knowledge transfer," Cooper said recently. "Our ultimate goal is to see that people with disabilities have as equal an opportunity to participate in society as everyone else."