As 2006 begins, the investigators and staff at HERL are exploring new opportunities to expand upon work begun just last year, conduct research at a new event, and analyze where we are going in the future.

This year we received funding to conduct 4 more of our popular “State of the Science” workshops with Walter Reed Army Medical Center (see “new grants,” page 5). These free workshops are open to military and VA personnel as well as patients and their families. Medical and rehab personnel may obtain Continuing Medical Education (CME) or Continuing Education Units (CEU) credits by attending. This year’s first workshop will address Sensory Impairment on April 21 (registration deadline is April 14) and the second is on Assistive Technology Devices on May 26, 2006 (registration deadline is on May 19). The SoS workshops are held at Walter Reed Army Medical Center (WRAMC) and participants can register and view the workshop agendas at our website, www.herlpitt.org. Workshop sponsors include the University of Pittsburgh Departments of Physical Medicine and Rehabilitation and Rehabilitation Science and Technology and the Center for Continuing Education in the Health Sciences. Subsequent workshops will be announced later this year...continue to check the HERL website for updates.

We held our yearly Advisory Board Meeting on March 27-28. The purpose of this meeting is to objectively evaluate our performance. Our 2006 advisory board was comprised of representatives from some of our collaborating institutions: Tom Stripling (Paralyzed Veterans of America), LTC Paul Pasquina (WRAMC), Diane Collins. (Front, L to R): CPT Allison Franklin (WRAMC), Rory Cooper, Shirley Fitzgerald (not pictured: Emily Teodorski)

The 2006 HERL research team at the DAV/VA Winter Sports Clinic. (Back, L to R): CPT Todd Wichman (WRAMC), Brad Dicianno, CPT Rob Wallach (Madigan Army Hospital), LTC Paul Pasquina (WRAMC). Diane Collins. (Front, L to R): CPT Allison Franklin (WRAMC), Rory Cooper, Shirley Fitzgerald (not pictured: Emily Teodorski)

As the summer approaches, so do two important annual HERL events: the Rehab Engineering and Assistive Technology Society of North America (RESNA) Conference and the National Veterans Wheelchair Games. This year’s NVWGs are being held in Anchorage, Alaska and a team of HERL investigators will be conducting studies there.

-Christine Heiner
CURRENT RESEARCH ABSTRACTS

Vibration Exposure of Individuals Using Wheelchairs over Concrete Paver Surfaces
Erik Wolf, MS, Jonathan Pearlman, MS, Rory A. Cooper, PhD, Shirley G. Fitzgerald, PhD, Annmarie Kel- leher, MS, Diane M. Collins, PhD, Michael L. Boninger, MD, and Rosemarie Cooper, MPT

Purpose of Work: According to the International Standards Organization 2631-1 standard on human vibration, individuals in a seated position are at risk of injury due to whole-body vibrations when exposed for long periods of time. Wheelchair users fit this description perfectly, however little research has been conducted to evaluate the amount of vibration transmitted to a wheelchair user. The purpose of this study was to evaluate the amount of vibrations transmitted to the user during travel of different sidewalk surfaces.

Procedures: Ten unimpaired subjects propelled over nine different sidewalk surfaces in a manual wheelchair and a powered wheelchair. One surface was a standard poured concrete sidewalk and each of the other eight was a concrete or brick paver of varying bevels.

Results: For the manual wheelchair, three surfaces resulted in higher vibration exposure than the standard surface; the 8mm bevel surface in a 90 degree herringbone pattern, and the two 6mm bevel surfaces. For the power wheelchair, two surfaces resulted in higher vibration exposure than the standard poured concrete the 8mm bevel surface and one of the 6mm bevel surfaces. Relevance to Wheelchair Users: Using smaller bevels on pavers exposes individuals using wheelchairs to less vibration. Also, pavers installed in a 90 degree herringbone pattern produced lower vibration exposures. It is recommended that only pavers of 6 mm bevel or less be used, with a 90 degree herringbone pattern. It is possible to provide sidewalks that are made from concrete or brick pavers that are also safe for wheelchair users.

-Erik Wolf, M.S.

Evaluation of the Safety and Durability of Low-Cost Nonprogrammable Electric Powered Wheelchairs
Jonathan Pearlman, MS, Rory Cooper, Ph.D., Jaideep Karnawat, Rosemarie Cooper, MPT, Michael L. Boninger, M.D.

Purpose of the work. To control rising healthcare costs, insurance companies may try to reimburse for lower-cost assistive technology, such as non-programmable electric powered wheelchairs (EPWs). With these lower-cost alternatives, it is important to make sure the devices function safely and effectively.

Subjects/Procedures: We performed ANSI/RESNA wheelchair standards testing protocols on 12 selected low-cost non-programmable EPWs (3 of each of four models) to measure durability and performance of the devices.

Results: We found that 9 out of 12 of these devices did not fulfill the required durability standards. Additionally, other safety issues, such as motor overheating, could adversely affect the performance of the device. Relevance to Wheelchair Users: To ensure the safety and maximum function of the user, high-quality EPWs must be available. The low-cost non-programmable EPWs we tested did not meet these standards, and EPW users should investigate the devices available to them.

-Jon Pearlman, M.S.
CURRENT RESEARCH ABSTRACTS

The Development and Preliminary Evaluation of a Training Device for Wheelchair Users: The GAMEWheels System
Shirley G. Fitzgerald, PhD; Rory A. Cooper, PhD; Emily Zipfel, BFA; Donald M. Spaeth, PhD, ATP; Jeremy Puhlman, BSE; Annmarie Kelleher, MS, OTR/L, ATP; Rosemarie Cooper, MPT, ATP; Songfeng Guo, PhD

Purpose of the Work. Training of appropriate wheelchair propulsion methods may be beneficial to manual wheelchair users by reducing pain and improving quality of life. This study involved the development and initial user testing of a haptic device, the GAMEWheels System, which combines wheelchair propulsion training and computer game play. 

Subject/Procedures. Two separate models of GAMEWheels were developed: a GAMEWheels Clinical and a GAMEWheels Trainer. To verify and compare the practicality and functionality of the two GAMEWheels systems, several focus groups were conducted: first to determine whether the systems could be set-up using different types of instructional materials and second to determine if the systems could be taught to novice users. In the first focus group, three subjects independently used both systems with the aid of instructional materials. Setup time was recorded and subjects completed a questionnaire to provide feedback on 1) ease of assembly 2) overall impression of assembly process 3) level of frustration during assembly and 4) usefulness of instructional materials. Open-ended questions probed subjects’ thoughts on how the device could be improved. In the second focus group, three experts each taught two novice subjects how to use the devices. The subjects then used the devices and responded to the questionnaire.

Results. Subjects’ overall impressions of the systems were that they were ‘fun’ to play. Suggestions were raised to improve the design, which have been incorporated into further refinement of the GAMEWheels systems. The trainer system was viewed more favorably than the clinical system. Subjects gave higher ratings of ease of learning and operating, more positive overall impressions, higher rating of perceived fun, and lower levels of reported frustration than with the clinical system.

Relevance to Wheelchair Users. For manual wheelchair users, use of their upper extremities is crucial to achieving and maintaining independence, both in and out of the home. Training individuals to propel a wheelchair in an appropriate manner could significantly reduce upper limb pain and injury. This research provides a technology solution to help train wheelchair users in appropriate propulsion techniques both in a clinical and a home setting. The results of focus group testing are used to improve product designs which will be transferred to industry and developed into marketable products.

-Emily Zipfel, BFA

Towards the Development of an Effective Technology Transfer Model of Wheelchairs to Developing Countries
Jon Pearlman, MS, Rory Cooper, Ph.D., Emily Zipfel, BFA, Rosemarie Cooper, MPT, Mark McCartney

Purpose of the work. In low-income countries, there is a tremendous need for wheelchairs (WC) to help people participate more fully in society, and live more independently. Developing a model to understand the factors that affect WC technology transfer to these countries will help streamline the process.

Subjects/Procedures: We reviewed pertinent literature and used personal experiences to develop a preliminary model of the factors affecting WC technology transfer to these countries.

Results. We developed a model which uses four characteristics (Input, Sustainability, Appropriateness, and Impact) to compare four tech-transfer models (Charitable, Workshop, Manufacturing, and Globalization).

Relevance to Wheelchair Users. Wheelchair users around the world require technology that meets their needs, and can maximize their potential to be part of their society. Understanding the process to both develop and deliver WCs to these individuals works toward this goal.

-Jon Pearlman, MS
HERL PUBLICATIONS


Also published in:


Current Events/Announcements

Pittsburgh Area Brain Injury Alliance (PABIA) is helping to activate a letter writing campaign in support of PA State Senate bill 887. The bill proposes to advance funds needed for research for the care and recovery of people with traumatic brain and spinal cord injury in Pennsylvania. People are encouraged to write to their local senators in support of 887. (To find your local rep and read more about the bill, visit www.pasen.gov). For more info on PABIA, visit their site www.pabia.org.

On Feb 20, The International Paralympic Committee became the first International Federation to launch its own Internet television channel, www.paralympicsport.tv. ParalympicSport.TV broadcasts 24/7 free of charge and holds video archives of the Torino 2006 Paralympic Winter Games.

UCP CARES is a new series of workshops being presented by United Cerebral Palsy of Pittsburgh, UCP Kids, and the Family Advocacy Network. Local and national experts speak on issues that aim to help children with disabilities connect to their communities at these workshops, targeting families of children with diverse abilities, teachers, and other professionals. For more information and a schedule of upcoming workshops, visit http://www.ucppittsburgh.org or contact UCP of Pittsburgh at (412) 683-4160.

A new magazine called Kids on Wheels launched this year. With upbeat photography and illustrations, KOW is a positive, motivating resource for kids with disabilities, as well as their families, rehab professionals, and teachers. To subscribe or advertise in KOW, contact No Limit Communications at 888-850-0344, or visit www.kidsonwheels.us.

The VA, Hiram G. Andrews Center, University of Pittsburgh Department of Rehab Science and Technology, and Uniformed University of Health Sciences are sponsoring a symposium, “Developing a Community Response” on May 3, 2006 at the University of Pittsburgh a Johnstown Living/ Learning Center. The symposium will identify best practices for providing for the needs of service members returning from Operation Iraqi and Operation Enduring Freedom. To register, call 814-255-7209.

NEW HERL GRANTS


HERL IN THE MEDIA

Disability Matters with Joyce Bender (Radio Show), Tuesday, January 23, 2006: Guest Rory Cooper. Show is archived on www.benderconsult.com.


Stroke Smart, January/February 2006: Choosing the Right Wheels, p. 28.

VA Research Currents, January 2006: VA Central Office Guest Speakers on March 31, 2005 (Alicia Koontz, Ph.D.)


News from the Department of Rehabilitation Science and Technology

Linda van Roosmalen, Ph.D. was awarded a grant from the National Collegiate Inventors & Innovators Alliance in Dec. 2005 for her proposal, “Wheelchair Mounted Pelvic Restraint.” The award is in the amount of $15,250. Dr. Roosmalen is an Assistant Professor at RST and an investigator with the RERCs on Wheelchair Transportation Safety and Telerehabilitation.

Sue Fuhrman’s paper, Characterization of Pediatric Wheelchair Kinematics and WTORS Loading in Rear Impact” was selected as one of the winning papers for the 2006 Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Student Scientific Paper competition.

News from the Department of Physical Medicine and Rehabilitation

Anthony E. Kline, Ph.D. received the American Academy of Physical Medicine and Rehabilitation, President's Citation Award for "Chronic Risperidone Treatment after Experimental Traumatic Brain Injury Negatively Impacts Functional Outcome"

The Dept of PM&R, along with the Depts. Rehab Science and Technology, Communication Science and Disorders, and the Center for Continuing Education in the Health Sciences are sponsoring the Institute of Rehabilitation and Research Day on June 1, 2006 at Thomas E. Starzl Biomedical Science Tower, Room S100 (University of Pittsburgh). For more information or to register for IRR day, visit the PM&R website: www.rehabmedicine.pitt.edu.

Featured HERL Student: Rachel Cowan

You have to be tough to succeed in the exciting but sometimes violent and aggressive sport of quad rugby. On the Pittsburgh Steelwheelers Rugby team, Rachel Cowan is the only woman on a team with 12 men. Regularly she comes to work with prominent and scary-looking bruises and scrapes, usually shrugging them off if anyone mentions them.

This is Rachel’s third year playing with the Steelwheelers; this year she received a sportsmanship award at the 2006 United States Quad Rugby Association (USQRA) Heartland Sectional Playoffs on March 17-19, 2006 in Montgomery, AL. She received the same honor in January 2005 at the USQRA’s 5th annual “Knock and Roll” Tournament in Jupiter, FL.

Rachel came to HERL from North Carolina in 2003 in pursuit of a Ph.D. in Rehabilitation Science and Technology. She holds a BS in Physical Education from the University of North Carolina (2000) and an MS in Health & Exercise Science from Wake Forest University (2003). Rachel works under the mentorship of Dr. Michael Boninger, primarily in the Biomechanics and Neuromotor Control Laboratory, evaluating wheelchair propulsion techniques. Rachel is a key member of the SmartWheel user’s group, which develops clinically relevant protocols and standards of use for the SmartWheel, a wheelchair propulsion measurement instrument developed at HERL. She is also a Integrative Graduate Education and Research Traineeship (IGERT) student. The IGERT program seeks to train PhD scientists and engineers in Assistive Technology at the University of Pittsburgh and Carnegie Mellon University. Only 4-6 HERL grad students are supported by the IGERT each year.

When Rachel is not working hard she is playing hard. She plays basketball on the Steel City Starz, lifts weights 3 times a week and does cardiovascular workouts 4-5 times a week in addition to playing rugby. This summer she also plans to add adaptive rowing to her schedule.

Upon completion of her PhD, Rachel hopes to become a Professor concentrating in biomechanics/human movement. “I like teaching,” she noted.

-Christine Heiner
HERL AWARD WINNERS

Eliana Chaves’ paper, “Community Participation Assessment of Individuals with Spinal Cord Injury”, and Michelle Tolerico’s paper, “Assessing the Activity Levels of Manual Wheelchair Users” were selected as two of the winning papers for the 2006 Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Student Scientific Paper competition.

Ian Rice, a HERL doctoral student, won first place in Los Angeles marathon wheelchair race on March 19, 2006.

Dr. Rory Cooper Delivers Inaugural Address at Pitt

On Tuesday, March 28, 2006, Dr. Rory Cooper gave his inaugural lecture to commemorate his official induction as FISA/PVA Endowed Chair and Distinguished Professor in the Department of Rehabilitation Science and Technology at the University of Pittsburgh. The prestigious ceremony was hosted by University of Pittsburgh Provost James V. Maher, who in his introduction praised Dr. Cooper highly for his numerous achievements in the fields of assistive technology research and academia. Dr. Maher presented Dr. Cooper with a Medal of Office, noting that his title was a unique one within the university.

Dr. Cooper's lecture was entitled, "Eat your own Dog Food: Participatory Action Design," referencing an expression used in engineering design. "It's really the idea that you shouldn't get other people to use your technology, your ideas or your devices before you'd use them yourself. And it's kind of put in that derogatory form of 'Eat Your Own Dog Food' because most of what we do the first time is unsuccessful. So it's kind of another way for engineers to say to learn from your own mistakes before you impose them on others," Cooper explained.

During his speech, Dr. Cooper shared much of his personal history that has shaped him into the successful researcher he is today, from his first experiences using a wheelchair, to his career in wheelchair racing, to his early attempts at designing wheelchairs. He outlined the evolution of his work, thanking many of his colleagues, co workers, mentors, and students for contributing to his successes along the way. "It's not an individual effort. It takes a group working together," said Cooper.

-Christine Heiner
ARE YOU INTERESTED IN WHEELCHAIR RESEARCH?

The Human Engineering Research Laboratories is recruiting individuals interested in participating in research studies for the WHEELCHAIR USERS REGISTRY. If you would like to be notified of Wheelchair related Research Studies for which you may be eligible to participate, contact The Human Engineering Research Laboratories and join the Wheelchair Users Registry. This is an informational resource and notification of a study does not obligate you to participate. You do not need to be located in nor are you required to travel to Pittsburgh in order to participate in research studies. If you are at least 18 years of age, and use a wheelchair or scooter, please contact Emily or Annmarie for more information.

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