HUMAN ENGINEERING RESEARCH LABORATORIES

HERL Newsletter

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Scenes from the 2008 CEATI Conference

On October 10, HERL and the Rehabilitation Engineering Research Center on Wheelchair Transportation Safety hosted the afternoon session of the Consortium for the Educational Advancement of Travel Instruction (CEATI)'s 2008 fall conference. CEATI instructors demonstrated wheelchair securement to clinicians and travel instructors on a Port Authority bus parked outside HERL at the Highland Drive VA Medical Center. The CEATI instructors and attendees also toured our research labs.

INSIDE THIS ISSUE:

ACCOMPLISHMENTS AND AWARDS

Michelle Sporner

Michelle Sporner, MS won a student poster award at the Pennsylvania Association of Rehab Facilities (PARF) conference on Sept. 23-26. Michelle presented her work introducing and practicing Rehabilitation Counseling to clinicians and patients at Walter Reed Army Medical Center during her 2008 internship. Jamie Schutte and Andrea Fairman, graduate students in the University of Pittsburgh Dept. of Rehab Science and Technology, also won poster awards.

Rich Simpson, Ph.D. received the 2008 United Cerebral Palsy of Pittsburgh's Norma J. Gianutsos Volunteer Award at their 16th Annual Community Heroes Award Dinner on October 22.

Rich Simpson, Ph.D.

A HERL research team was commended at the University of Pittsburgh's Office of the Provost & Office of Technology Management's 4th Annual Celebration of Innovation reception on Oct. 6. Pitt faculty, staff, and students received Innovator Awards for inventions that have been licensed or optioned with start-up companies. The wheelchair convoy system, a technology that allows multiple people in chairs to be safely moved at one time and was licensed to a company in October 2007, won an Innovator Award. HERL researchers **Richard Simpson, Ph.D., Joe Olson, B.S., Jeremy Puhlman, B.S.** worked on the project with Vinod Sharma (Pitt Dept. Bioengineering), Ed LoPresti, Ph.D., and Caz Mostowy (both from AT Sciences).

CURRENT RESEARCH ABSTRACTS

Preliminary Study on the Impact of Pushrim Activated Power Assist Wheelchairs Among Individuals with Tetraplegia

Dan Ding, PhD; Ana Souza, MS; Rory A. Cooper; PhD, Shirley G. Fitzgerald, PhD,
Rosemarie Cooper, MPT, Annmarie Kelleher, OTR/L, MS, Michael L. Boninger, MD

Full article published in **American Journal of Physical Medicine and Rehabilitation**, pp. 821-829, Vol. 87, No. 10, October 2008.

Purpose of Work. Pushrim Activated and Power Assist Wheelchairs (PAPAWs) are typically manual wheelchairs with a motor linked to the pushrim in each rear hub, where the pushrim input is sensed and amplified proportionally by the motor. The study evaluates the impact of PAPAWs on mobility, community participation, satisfaction, and psychosocial impact among individuals with tetraplegia.

Subjects/Procedures. Fifteen manual wheelchair users with tetraplegia completed a two-week trial in their own chair as well as a two-week trial in the PAPAW. They did have the freedom to choose to use their own chair during the two-week period when they had the PAPAW. The mobility levels with both wheelchairs were recorded by a wheel rotation data logging device. Participants completed daily questionnaires regarding community participation and their satisfaction with the wheelchair used. The Psychosocial Impact of Assistive Devices Survey (PIADS) was conducted to compare the psychosocial impact of PAPAWs with their personal wheelchairs.

Results. Participants chose to use PAPAWs and their personal wheelchairs at a similar frequency, but traveled further and spent more time using PAPAWs. They also traveled significantly faster with PAPAWs. PAPAWs resulted in greater satisfaction and psychosocial impacts than the personal wheelchairs.

Relevance to Wheelchair Users. PAPAWs provide independent mobility both indoors and outdoors. They may require fewer modifications to home and motor vehicles than power wheelchairs, and are more capable of traversing a variety of difficult terrain than manual wheelchairs. However, transportability could be a problem with PAPAWs due to the heavy weight of the wheels, and difficulty in disassembly. A user's preference, life style, physical conditions, transportation issues, and environmental factors should be considered in prescribing such a device.

-Ana Souza, MS

Relationship Between Quality of Wheelchair and Quality of Life

Sandra Hubbard Winkler, PhD, OTR/L, ATP, Shirley Fitzgerald, PhD
Michael Boninger, MD, Rory A. Cooper, PhD

Full article published in **Topics in Geriatric Rehabilitation**, Vol. 24, No. 3, pp. 264-278, July-September 2008.

Purpose of the Work: There is compelling evidence that suggests mobility, access to the community, and social integration enhances quality of life. In fact, social participation is a more important predictor of quality of life than physical functioning or extent of injury. This study investigated the research question: does a higher quality wheelchair improve quality of life? Or, can a poorly designed wheelchair limit a user's potential for community access, thus increasing disability?

Subjects: Existing veteran records from Veterans Administration databases were merged to create a dataset of 61,428 veterans who received a wheelchair. There was no information in the datasets that could identify individual veterans.

Results: The veterans who received higher quality manual wheelchairs reported significantly more physical disability and significantly less mental disability and better general health than veterans who received lower quality depot manual wheel chairs. In contrast, the veterans who received high quality power wheelchairs reported less disability than veterans who received standard power wheelchairs.

Relevance to Wheelchair Users: Prescription of wheelchairs should be based on user need. Results of this study suggest that both user need and clinical practice are factors effecting provision. The results of this study support training in seating and mobility and establishment of clinical practice guidelines as a means of increasing equity in the provision of wheelchairs.

-Sandra Hubbard Winkler, PhD, OTR/L, ATP

CURRENT RESEARCH ABSTRACTS

Shoulder Ultrasound Abnormalities, Physical Examination Findings and Pain in Manual Wheelchair Users with Spinal Cord Injury

Steven W. Brose, DO, Michael L. Boninger, MD, Bradley Fullerton, MD, Thane McCann, MD, Jennifer L. Collinger, BSE, Bradley G. Impink, BSE, Trevor A. Dyson-Hudson, MD

Full article published in **Archives of Physical Medicine and Rehabilitation**, pp. 2086-2093, Vol. 89, No. 11, November 2008.

Purpose of the work: To investigate the presence of ultrasound abnormalities in manual wheelchair users with spinal cord injury (SCI) using a quantitative Ultrasound Shoulder Pathology Rating Scale (USPRS). To investigate physical examination (PE) findings using a quantitative Physical Examination of the Shoulder Scale (PESS), and to obtain data about pain and other subject characteristics such as age, years with SCI, and weight.

We recruited athletes at the National Veterans Wheelchair Games to undergo physical exams and shoulder ultrasound in order to investigate shoulder pain and injury in wheelchair users.

Subjects and Procedures: Forty-nine individuals with SCI who used a manual wheelchair as their primary means of mobility were recruited at the National Veterans Wheelchair Games. Participants answered questionnaires and had both physical and ultrasound examinations of the shoulders.

Results: Higher USPRS scores, meaning more abnormalities, were more common in individuals with greater age, years with SCI, and weight. Heavier participants were more likely to have shoulder pain. Higher PESS scores were more common in individuals reporting shoulder pain during daily activities.

Relevance to Wheelchair Users: As individuals with SCI age and spend more time propelling a manual wheelchair, the likelihood of developing rotator cuff abnormalities and pain increases. It appears that increased body weight is a contributing factor and therefore maintaining an ideal body weight may be one means of preventing shoulder pain and pathology. Untreated shoulder pain is common in manual wheelchair users with SCI, and further investigation of this pain is needed.

-Brad Impink, BS

Quantifying Wheelchair Activity of Children: A Pilot Study

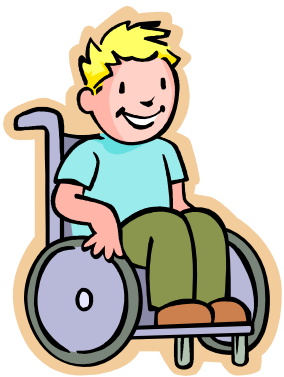
Rory A. Cooper, PhD, Michelle Oyster, MS, Beth Ann Kaminski, MS, Donald Spaeth, PhD, Dan Ding, PhD, Rosemarie Cooper, MPT, ATP

Full article published in **American Journal of Physical Medicine and Rehabilitation**, pp. 977-983, Vol. 87, No. 12, December 2008.

Purpose of the Work: The purpose of this study was to investigate mobility related wheelchair activity of children in their community setting.

Subjects and Procedures: Mobility related wheelchair activity data from 18 community dwelling children (9 manual and 9 electric powered) were collected using custom designed data logging devices. The children were between the ages of 8 and 17 years of age and independently used a wheelchair as their primary means of mobility. A data logging device was installed on their wheelchair for five to seven days.

Results: Overall, the children who used manual wheelchairs traveled on average 1602.31 meters per day at a speed of 0.67 meters per second and the children who used electric powered wheelchairs drove 1752.42 meters per day at a speed of 0.75 meters per second. It was also calculated that the average daily number of starts stops per thousand meters the manual and electric powered wheelchair users completed were 166.77 and 112.53, respectively. A comparison of mobility related wheelchair activity revealed that the boys were more active than the girls. Also, the children were more active during the weekdays when compared to weekends.



Clinical Relevance to Wheelchair Users: The ability to measure wheelchair mobility among children provides useful information on daily activity.

-Michelle Oyster, MS

State of the Science Symposia on Ultrasound Techniques and Polytrauma

Civilian, veteran, and military populations can benefit from the exchange of the state of the science in clinical practice, research, and development. The rapid revolution currently taking place in medical, surgical, and rehabilitative care has become increasingly difficult for practitioners to keep up with. Given the overall goal to provide world-class care to our injured soldiers and veterans, the purpose of the HERL/Walter Reed Army Medical Center Symposia Series is to bring expert scientists conducting state of the art research to the Army Medical Department, to help severely injured soldiers requiring medical rehabilitation. A secondary goal is to increase research in medical rehabilitation in the Army Medical Corp through collaboration with proven scientists. Many severely injured GWOT soldiers will need to adapt to physical impairments for years to come. State of the science care, advanced technology, and the dedication and skill of Army, Department of Veterans Affairs (VA), and affiliated personnel are crucial for the successful reintegration of soldiers into their communities and when possible back to active or reserve service in the Army.

Top: Speakers on day one of the Ultrasound on Sept. 25-26. (L to R): Nelson Hager, MD, Paul Lento, PhD, Scott Primack, DO, Rory Cooper, PhD, Jeff Strakowski, MD, Katherine Alter, MD, Jay Shah, MD, Michael Boninger, MD, Siddhartha Sikdar, PhD, Kevin Fitzpatrick, MD. Bottom: Workshop participants learn about Ultrasound imaging from HERL Doctoral student Brad Impink

Another important component is to ensure that the Army, Navy, VA and U.S. academic and private sector research community are effectively communicating and planning for the long-term care of soldiers leaving active duty due to the injuries that they incurred in the service of our country. The Army Medical Department is working with the VA to ensure that the process of moving patients from one healthcare system to the other is as seamless as possible. The symposia bring together key Army, Navy, VA, and Academic and federal rehabilitation leaders. This unique State-of-the-Science workshop series is made possible through grant funding from the Telemedicine and Advanced Technology Research Center (TATRC). Paralyzed Veterans of America also supports the series and is a valued partner.

The final 2 symposia of our 2008 series covered the areas of Ultrasound Techniques (diagnostics, guided injections, instruction), and Polytrauma Medicine (Pharmokinetics, Clinical Trials, Vocational Outcomes, Psycho-Social Issues, Acute Management).

Ultrasound Techniques, a two day event at WRAMC on September 25-26, served to inform attendees about the innovations in current clinical practices and research studies associated with diagnostic ultrasound. The symposium showcased some of the country's foremost authorities on ultrasound technology and speakers covered topics ranging from current clinical practices to new initiatives in the early phases of research. Diagnostic ultrasound has proven itself as a useful and reliable technology in the evaluation and intervention of a number of neuromuscular abnormalities. Proper use by a trained clinician can lead to the early detection and treatment of various neuromuscular conditions before they become chronic and debilitating, saving billons in related health care costs while preserving function of the individual.

While the symposium provided the audience with a unique learning opportunity to observe state of the science information, the fun part was discovered in the hands-on workshop the following day. The attendees were divided into four groups and each group was assigned to a "station" where participants were able to interact with the instructors and learn practical hints on how to perform ultrasound evaluations of different parts of the body. At the end of each hour, the participants rotated between stations, and by the end of the workshop, every attendee had a chance to "get their hands dirty" with some gel, performing ultrasonic examinations under the guidance of the

experts.

In 2008, there may be no topic as hot as polytrauma medicine, due to the influx of veterans returning from OIF/OEF. On November 7, professionals from various disciplines traveled to Walter Reed to present the state of the science on polytrauma, highlighting the complexity of these injuries military service members and veterans are currently facing. Polytrauma consists of a multitude of injuries including traumatic brain injury (TBI), amputations, burns, blast trauma, sensory organ injuries, Post-Traumatic Stress Disorder, and other mental health injuries. While the costs of war reaches far beyond a monetary sum, one positive outcome is the advancement in medical and rehabilitative care to treat our military service members which translates into best care practices throughout the general population. Currently, there are two concepts of interest to researchers to help explain why certain individuals who are exposed to severe blasts and have mild impairments in function – resilience and protective factors. Researchers have attributed these two ideas to the individual's strengths, expectations, locus of control, social supports, and premorbid history. Assistive technology examples for enhancing communication and facilitating mobility for veterans with polytrauma were also discussed. The importance surrounding community reintegration and return to duty was another important theme conveyed at the workshop. This generation of service members is returning to active duty at a rate higher than any previous generation. In addition to veterans seeking employment in the civilian sector, another means to promote community integration is through sporting and recreation opportunities for military veterans. Highlights of the 2008 Paralympic Games were shared with the audience; close to 10% of the athletes that competed in this year's games were military veterans.

Dr. Rory Cooper and Dr. Allison Franklin share highlights from the 2008 Paralympic Games with the attendees of the State of the Science Workshop on Polytrauma on November 7, 2008.

HERL and WRAMC will continue the State of the Science workshops through next year. The 2009-2010 symposia series will consist of five single day courses and workshops, which will cover topics of extreme relevance to the Army Medical Department – Rehabilitation Medicine Component (AMD-RMC). The topics are to include: Activity Based Rehabilitation Strategies (e.g., functional electrical stimulation, robot assisted therapies, sports and recreation, core-strengthening, exergaming), Prosthetics and Amputee Care (e.g. prosthetics engineering, haptic devices, brain control interfaces, surgical techniques), Regenerative Rehabilitation (e.g., tissue engineering, limb salvage, tissue regeneration), Virtual Reality in Rehabilitation (e.g., VR for PTSD, VR for TBI, VR for AT Assessment, VR for Amputee Rehab), and Appropriate Technology and Community-Based Rehabilitation (delivery of rehabilitation services in developing countries, assistive technology fabrication, low-cost prosthetics fitting, cultural competency). These topic areas were selected based upon the injuries being experienced by soldiers serving in the Army that often result in the need for long-term medical rehabilitation, as well as the support of the Army's humanitarian mission. World-class clinician scientists conducting relevant research will be invited to present. This will provide important benefits for the AMD-RMC, including the training programs at Walter Reed Army Medical Center and the National Capital Consortium, and for other government agencies, and the public at-large.

The next scheduled symposia will be Activity Based Rehabilitation Strategies on January 23, 2009. All of the symposia will continue to be free and all civilians, government, patient, family member, provider, academics, industry, and researchers are invited. CEUs and CMEs will continue to be offered through the University of Pittsburgh at no-cost to symposia participants.

-Mary Goldberg, M.Ed., WRAMC Symposia Coordinator

Workshop registrations are posted on www.herlpitt.org . For more information about the workshops, contact Mary Hershberger at 412-954-5287 or mrh35@pitt.edu.

Sign up for e-mail announcements for future State-of-the-Science workshops at http://listserv.herlpitt.org.

HERL PUBLICATIONS

Hubbard SL, Fitzgerald SG, Boninger ML, Cooper RA, Relationship Between Quality of Wheelchair and Quality of Life, **Topics in Geriatric Rehabilitation**, Vol. 24, No. 3, pp. 264-278, July-September 2008.

Ohnabe H, The Role of Information Sharing by the Conference of Rehabilitation and Assistive Technology, **Rehabilitation Engineering**, pp. 128-131, Vol. 23, No. 3, August 2008.

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Cooper RA, Dicianno BE, Brewer B, LoPresti E, Ding D, Simpson RC, Grindle GG, Wang H, A Perspective on Intelligent Devices and Environments in Medical Rehabilitation, **Medical Engineering and Physics**, pp. 1387-1398, Vol. 30, No. 10, December 2008.

Cooper RA, Tolerico M, Kaminski B, Spaeth D, Ding D, Cooper RM, Quantifying Wheelchair Activity of Children: A Pilot Study, **American Journal of Physical Medicine and Rehabilitation**, pp. 977-983, Vol. 87, No. 12, December 2008.

Dicianno BE, Kurowski BG, Yang J, Chancellor MB, Benjjani GK, Fairman AD, Lewis N, Sotirake J, Rehabilitation and Medical Management of the Adult with Spina Bifida, **American Journal of Physical Medicine and Rehabilitation**, pp. 1026-1050, Vol. 87, No. 12, December 2008.

HERL IN THE NEWS

KPVA Parascope, p. 1, September/October 2008: KPVA + NVWG + Omaha = 28 Medals

Cleveland Plain Dealer, September 23, 2008: New Devices on the Market or in the Works Aim to Help Elderly Users Navigate Life with More Ease

Pitt Chronicle, October 13, 2008: Newsmakers

News from our Partners at the University of Pittsburgh

The Rehabilitation Engineering Research Center (RERC) on Telerehabilitation held the 1st Virtual State of the Science conference November 17-20, 2008. The conference, held entirely online, allowed over 200 rehabilitation professionals from 16 countries to interact and discuss issues related to telerehabilitation. Co-Directors David Brienza, PhD and Michael McCue, PhD and the RERC team presented on the technology infrastructure, clinical and vocational applications, accessibility and usability, and policy tools and research over four days. The RERC on Telerehabilitation is sponsored by the National Institute on Disability and Rehabilitation Research, Grant # H133E040012.

Michael Boninger, MD, Dept. of Physical Medicine and Rehabilitation (PM&R) Chair and HERL Medical Director was appointed Program Director of the Rehabilitation Medicine Science Training Program. The program provides training, mentorship, and career development support for physiatrists with the goal of increasing the number of experts in PM&R and rehabilitation science. The RMSTP was made possible through funding from the National Institutes of Health, the National Institute of Child Health and Human Development, and the National Center for Medical Rehabilitation Research.

IMPORTANT ANNOUNCEMENTS

Everyone at HERL would like to wish all our newsletter subscribers and research participants a safe and happy holiday season. We would also like to make everyone aware of a few important changes.

Due to the VA's new phone system installation, we have a new phone and fax number. **Our new phone number is (412) 954-5287 and our new fax number is (412) 954-5340.** Please be aware that callers who dial our old phone number will be redirected to the main VA Pittsburgh Healthcare System phone number. We don't want to miss your calls if you are trying to reach us; please make a note of our new numbers.

Also, we are using a new method to distribute this newsletter by e-mail. Instead of sending the newsletter to readers through my e-mail account, **we are now using our own listserv to send out the newsletter announcements.** Listserv is mass e-mail distribution software that allows users to manage their own subscriptions and automatically maintains subscriber lists. Readers can join or leave the HERL newsletter e-mail distribution by either of the following methods:

1.WEB: Visit http://listserv.herlpitt.org
2.E-MAIL:HERL_NEWSLETTER_ANNOUNCE @LISTSERV.HERLPITT.ORG with the word
3.SUBSCRIBE or UNSUBSCRIBE in the body of the e-mail.

As a precaution, please add the e-mail address HERL_NEWSLETTER_ANNOUNCE @LISTSERV.HERLPITT.ORG to your address book or configure your e-mail to allow incoming messages from this address to continue to receive our newsletter without interruption. This new software should improve our efforts to successfully deliver our newsletter to your inbox.

We are also using Listserv to distribute announcements about our State of the Science workshops at Walter Reed Army Medical Center (WORKSHOP_ANNOUNCEMENTS@LISTSERV.HERLPITT.ORG) and to recruit for our undergraduate intern programs (REU_RECRUITMENT @LISTSERV.HERLPITT.ORG). People may join those lists as well by visiting http://listserv.herlpitt.org or by e-mailing either list with the word SUBSCRIBE or UNSUBSCRIBE in the body of the e-mail.

-Christine Heiner, editor

Upcoming Events

The International Symposium on Quality of Life Technology will be held **June 30-July 1, 2009 at University Club in Oakland, Pittsburgh, PA.**
The symposium is aimed at research scientists, industry engineers, health care clinicians, graduate students, and other professionals interested in the service technologies and applications of human daily activities.
Symposium Sessions will include plenary and poster presentations, a Future Challenges in Quality of Life Technologies Panel, and an Exhibition.
Submissions for papers and posters are due by February 5. Requested paper topics are Rehabilitation Engineering, Robotics, Human System Interaction, and **Impact of Technology on Quality of Life.**
Learn more and register for the conference at http://www.shrs.pitt.edu/cms/QoLT/QoLT.asp?id=821

HERL in the Community

Education and Outreach Coordinator Mary Goldberg attended the premiere of "Voices of our Region", an oral documentary made from testimonials of several people living with disabilities in southwestern PA. The event was hosted by Allegheny County Disability Connection on November 20. Information about the event and many of the interviews are available on www.voicesofourregion.com.

HERL was honored to be included in the Mobility Works Expo at the Pittsburgh Mobility Works Dealership on October 16th. This yearly event unites people with disabilities with representatives from local disability agencies and assistive technology vendors. Over 300 people attended the expo, which also included food, door prizes, and raffles. Among the 20+ exhibitors were our affiliates the Center for Assistive Technology and Keystone Paralyzed Veterans of America. Mobility Works has announced the date for next year's Expo: Thursday, October 15, 2009. HERL plans to attend again. We hope to see you there!

Human Engineering Research Laboratories

Mailing Address:
VA Pittsburgh Healthcare System
7180 Highland Drive
Building 4, 2nd Floor East Wing, 151R-1
Pittsburgh, Pa, 15206

Rory A. Cooper, Ph.D.
Director

Michael L. Boninger, M.D.
Medical Director

Jonathan Pearlman, Ph.D.
Associate Director of Engineering

Brad Dicianno, MD
Associate Medical Director

Phone: 412-954-5287
Fax: 412-954-5340

E-mail any comments, corrections, or questions concerning the newsletter to the editor, Christine Heiner at:
Email: heinercm@pitt.edu

Please visit our website!
www.herlpitt.org

VA Center Of Excellence For Wheelchairs and Associated Rehabilitation Engineering

University of Pittsburgh NIDRR Model Center on Spinal Cord Injury

Part of
Quality of Life Technology Center
a National Science Foundation Engineering Research Center

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All newsletters are archived on our website, www.herlpitt.org.

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**, **Annmarie, or Michelle** for more information.

VA PGH Healthcare System 7180 Highland Drive
Pittsburgh, PA 15206

412-954-5287 **registry@herlpitt.org** **www.herlpitt.org**