



HERL Newsletter

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HERL Prepares for Cross-town Move

HERL is on the move! HERL's long-awaited move to the Bakery Square complex in Pittsburgh's East End is scheduled for July 2011.

Since 1993, HERL has called the VA Pittsburgh Healthcare System's Highland Drive Campus home. But ten years later, when the Department of Veterans Affairs first identified the site for closure, HERL director Dr. Rory Cooper knew that a future relocation of his labs might be in the works.



After an exhaustive search around Pittsburgh for appropriate space, in October 2010 the VA leased 26,000 square feet in Bakery Square, so named because it housed the Nabisco bakery until 2004. Work began soon after to design a floor plan to accommodate HERL's needs. Dr. Cooper gave final approval to the design at the end of January 2011.

"We'll miss being within an actual VA medical center, and being around Veterans every day," said Dr. Cooper. "We've just outgrown this space—it's been useful to us for 17½ years, but it was never designed to be a research space."

Construction on the completed floor plan will begin this month. "The best thing about the new space is that it's custom-designed for us. All of our research will fit," said Dr. Cooper.
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Work Continues Locally on Upcoming 2011 National Veterans Wheelchair Games



Dr. Rory Cooper competes in the slalom event at the 2009 NVWG in Denver.

The Games are on the clock here in Pittsburgh. In less than six months, over 500 athletes will answer the call to compete and converge here for the 31st National Veterans Wheelchair Games, hosted by VA Pittsburgh Healthcare System and the Keystone Paralyzed Veterans of America.

The Games will take place August 1-6 at five different venues around the Pittsburgh area: the David Lawrence Convention Center, Princess Bowling Lanes, the Clairton Sportsmen's Club, Shadyside Academy, and Trees Hall on the University of Pittsburgh campus.

There are 17 different events for athletes, and admission to all events is free and open to all. *Continued on p. 4.*

CURRENT RESEARCH ABSTRACTS

Utilizing The Spina Bifida Lifecourse Model in Clinical Practice: An Interdisciplinary Approach

Brad E. Dicianno, MD; Andrea D. Fairman, MOT, OTR/L, CPRP;

Shannon B. Juengst, MS, CRC; Patricia G Braun PH.d, MSN, MA, CPNP, RNC

Full article published in *Pediatric Clinics of North America*, pp. 945-957, Vol. 57, No. 4, August 2010.

A lifecourse model for patients, families, caregivers, teachers, and clinicians was developed with support by the National Spina Bifida Program, National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention for individuals with spina bifida. The lifecourse model facilitates a developmental approach to assessment and intervention along life's trajectory. This life course model provides information about key developmental milestones for particular age groups, validated assessments that can be performed by clinicians or teachers to determine if milestones have been

reached, useful suggestions for intervening in creative ways at each step, and evidence-based references. In this paper, we introduce the viewpoints of several key clinicians who are involved in the care of individuals with spina bifida and how the life course model can assist them, their patients, and their families in the process of assessment, intervention, collaboration with other clinicians, and followup. A case study will be utilized to demonstrate the experience of comprehensive and collaborative management in transitioning a child and his family from infancy to adulthood.

Manual Wheelchair-Related Mobility Characteristics of Older Adults in Nursing Homes

Amol M. Karmarkar, MS; Diane M. Collins, PhD; Annmarie Kelleher, MS, OTR/L, ATP, CCRC;

Dan Ding, PhD; Michelle Oyster, MS, CCRC; Rory A. Cooper, PhD

Full article published in *Disability and Rehabilitation: Assistive Technologies*, pp. 428-437, Vol. 5, No. 6, 2010.

Manual wheelchairs are the most commonly prescribed form of mobility devices for older adults in nursing homes. Because the extent of their utilization is unknown, prescription of standard wheelchairs that are irrespective of difference in users' characteristics may result. The purpose of this study was to quantify manual wheelchair use by nursing home residents with the use of an objective assessment.

Seventy-two independent wheelchair users without cognitive impairments were recruited from four nursing homes (two VA-affiliated and two private). A customized wheelchair data-logger was attached to each participant's wheelchair for one month. Data were reduced and compared separately for VA-affiliated versus private facilities by types of propulsion pattern (arms versus legs/combination) and between types of wheelchairs (depot versus lightweight). Those participants who used their arms to propel their wheelchairs were significantly more active compared to participants who used their legs or an arm and leg in combination to propel their wheelchairs for VA-affiliated facilities as measured by distance and velocity. No differences were identified by type of wheelchair, nor were differences identified for private facilities in use of wheelchairs, between propul-

sion patterns, or type of wheelchair used. Older adults living in nursing homes and who use wheelchairs represent a diverse cohort.

The efficacy of using an objective assessment method for measuring use of wheelchairs was demonstrated by this study. This objective assessment method will help clinicians identify needs of older adults for prescribing individualized and customizable wheelchairs, rather than provision of standard wheelchairs.



A. Custom data logger attached to manual wheelchair wheel.



B. Data logger opened to view components.

CURRENT RESEARCH ABSTRACTS

Effect of an Intense Wheelchair Propulsion Task on Quantitative Ultrasound of Shoulder Tendons

Jennifer L. Collinger, PhD; Bradley G. Impink, BSE; Haishin Ozawa, MS; Michael L. Boninger, MD

Full article published in *Physical Medicine and Rehabilitation*, pp. 920-925, Vol. 2, No. 10, October 2010.

Purpose of the Work: The majority of manual wheelchair users will experience shoulder pain or injury. The repetitive loading of the arm that occurs during wheelchair propulsion likely contributes to the development of injury. In this study, we used ultrasound to look at changes in biceps and supraspinatus tendon appearance after an intense wheelchair propulsion task and how these changes relate to demographic and biomechanical risk factors.

Subjects/

Procedures: Sixty manual wheelchair users participated in this study at our laboratory or at the 2007 and 2008 National Veterans Wheelchair Games. Subjects were between 18 and 65 years of age at least one year post-injury, and did not have progressive disabilities. A quantitative ultrasound examination of the biceps and supraspinatus tendons was performed before and after the subjects propelled on a figure 8-shaped course for 15 minutes (including rest breaks) at their maximum speed. This exam provided measurements of tendon size, brightness, and structure. Resultant force at the pushrim and stroke frequency were measured during

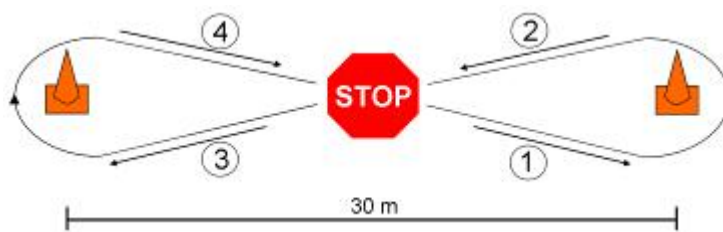
the propulsion task.

Results: Biceps tendon appearance after an intense propulsion task was significantly related to chronic biceps tendinopathy, duration of wheelchair use, stroke frequency, and resultant force. Subjects with a higher stroke frequency or resultant force tended to

have a brighter, more organized tendon appearance as compared to the pre-propulsion imaging session (baseline). Subject with tendinopathy or a longer duration of wheelchair use were more likely to have a darker, diffuse tendon

appearance immediately after the propulsion task. Supraspinatus tendon appearance post-propulsion was only significantly predicted by baseline quantitative ultrasound measures.

Relevance to wheelchair users: The biceps tendon responds differently to propulsion based on risk factors for chronic pathology. Quantitative ultrasound of the biceps tendon may provide insight about the development and prevention of repetitive strain injuries.



Schematic of the figure 8-shaped propulsion course.

QoLT REU Program Funds Renewed

QoLT is pleased to announce that its Research Experience for Undergraduates (REU) program has been funded by the National Science Foundation for another three years.

The renewal of the Quality of Life Technology Research Experience for Undergraduates Site is a tremendous accomplishment for our education and outreach program. This demon-



strates that we have achieved our objectives for the first four years of the program and continues to build upon the successful foundation of the complementary American Student Placements in Rehabilitation Engineering (ASPIRE) REU program. This will allow us to host twice the number of students (compared with just ASPIRE alone) and create a cohort of students engaged in assistive technology research across Pitt and CMU. —Mary Goldberg

Bakery Square, cont.



Equipment that has been in storage up to now will be able to be used on a daily basis, he added.

The space at Bakery Square will accommodate 17 offices, a cubicle area for research associates, and lab areas on two floors. Much of the lab space will be open-plan, with dividers able to be added as necessary. Because of this reconfiguration, the amount of lab space will almost double.

While HERL as a whole will move to its new facilities in July, HERL staff has already been becoming familiar with the space. The Department of Rehabilitation Science and Technology at the University of Pittsburgh currently maintains a robotics lab at Bakery Square where some HERL project work is done.

Wheelchair Games, cont.

Athletes still have time to sign up—but registration closes April 15, so act quickly. Registration packets can be downloaded at pva.org. For questions about registration, contact Andy Krieger at (800) 424-8200, ext. 757 or andyk@pva.org.

Organizing such a large, complicated event requires a huge amount of coordination, but the work continues. HERL director Dr. Rory Cooper, the local organizing committee chair, says, “We’re continuing to move forward – we’ve got good committees and good committee chairs, and they’re working hard. We’re expecting a high turnout.”

However, Dr. Cooper cautioned that more volunteers are currently needed. “We need 3000 volunteers, but we only have 600 right now,” he said.

If you’d like to volunteer, or know someone else who would, contact Richard Kiehn at (412) 954-4582 or Richard.Kiehn@va.gov.

The event was recently boosted by the donation of \$100,000 from local insurer Highmark Inc. Sponsors, big and small, are still welcome! For more information about donating, contact Joseph Dornbrock at (412) 781-2474 or keystonepva@comcast.net.

UNDER CONSTRUCTION!



These photos show HERL's Bakery Square offices in September 2009. Stay tuned for much more recent photos ...

Staff Profile: Juan J. Vazquez

Juan J. Vazquez, M.S. has been promoted to Electrical Engineering Coordinator for HERL. Juan will supervise the Electronics Lab and create a new infrastructure so the electronic components of HERL projects are more organized and run more efficiently which will ultimately expedite the goals of each project.

Juan graduated with honors from the University of A Coruña, Spain and also attended The University of Valladolid, Spain where he earned his Master's Degree in Electronics and Automation Engineering. As a visiting Research Scholar from Carnegie Mellon University, he was invited to HERL to provide guidance and assist with HERL projects. In 2007, Juan was hired as Research Engineer.

Recently, Juan developed code for the PerMMA (Personal Mobility & Manipulation Appliance) project, which allows users with upper extremity impairment to manipulate objects with robotic arms. PerMMA is a collaboration with the Engineering Research Center at Carnegie Mellon University and has earned national recognition.



Juan at his desk.

Juan will also be developing the electronics and automation engineering aspects for a new research project funded by the VA Healthcare VISN 4 Pittsburgh office: Development of an Assistive Kitchen for People with Cognitive Impairments. This project aims to develop a kitchen that can detect user actions and provide active implicit prompts to guide tasks.

Finally, Juan is currently implementing many new processes within the electronics lab, and his new ideas are helping to make HERL much more efficient. —*Andrea Bagay*



HERL in the News

RT (Russia Today) network:

Spotlight: Empowering people with disabilities (September 12, 2010)
<http://rt.com/programs/spotlight/empowering-people-disabilities-ivanova/>

Featuring Veronika Ivanova, Disabled Rights Advocate. *A new state program will set new standards for cities in an attempt to make them more disabled-friendly. But is it rather a problem within our minds? Veronika Ivanova, a University of Pittsburgh alumna of the Department of Rehabilitation Science & Technology and an expert in rehabilitation and disability, discusses this issue.*

Science Channel network: Innovation Nation: Wheelchair (December 14, 2010)

Featuring Dr. Rory Cooper of the University of Pittsburgh.

Among 26 Innovation Nation features scheduled to air on the Science Channel through January 2011.

Chemistry World: With a little help from our friends (December 2010)

Pursuing a scientific career with a disability presents a unique set of challenges. But as Mike Brown discovers, anything is possible with a little support.

Pittsburgh Post-Gazette: Neurologist with MS pain needed immediate relief (December 13, 2010)

When Dr. Michael Mabry's wheelchair tilt function malfunctioned and he was advised to replace it, the University of Pittsburgh/UPMC's Center for Assistive Technology was one of the first places he went.

Daily Tech: Florida researchers begin development of all-terrain electric wheelchairs (January 2011)

<http://www.dailytech.com/Florida+Researchers+Begin+Development+of+AllTerrain+Electric+Wheelchairs/article20546.htm>

Florida State University College of Engineering researchers, inspired by the University of Pittsburgh's Human Engineering Research Laboratories, have started developing an electric wheelchair that will be capable of traveling through rough terrain.

Pittsburgh Tribune Review: Wheelchair games coming to Downtown, Oakland (January 11, 2011)

http://www.pittsburghlive.com/x/pittsburghtrib/news/pittsburgh/s_717549.html

More than 500 athletes are expected in Pittsburgh Aug. 1-6 for the National Veterans Wheelchair Games.

QoLT Attends Consumer Electronics Show

The Quality of Life Technology (QoLT) Center returned to the Consumer Electronics Show for the 3rd consecutive year at the Las Vegas Convention Center January 6-9, 2011. QoLT was a focal point in the Digital Health Summit, a sector of the show which focused on the booming market of consumer-based innovations where technology and healthcare converge. As this industry is rapidly expanding, the summit offered groundbreaking technologies and consumer solutions aimed at improving outcomes, generating business opportunities, and moving beyond hospitals and doctors' offices—transcending the traditional healthcare model.

QoLT was one of the few academia-related booths in this area, though it did feature a recently released software product available for purchase. Lean and Zoom, available for download at www.leanandzoom.com for \$27.99, was released at the show and ended up being featured on hundreds of news programs and podcasts. The product, designed for people with low vision, enables the user to zoom in to the point of their cursor by simply leaning towards the screen. Designed by Chris Harrison, a PhD student at the Robotics Institute at CMU, this product is one of the first to use an internal (or web) camera as an input device.



The Lean and Zoom table.

Dr. Bambi Brewer, Assistant Professor at the Department of Rehabilitation Science and Technology and an investigator at HERL, featured her Intuitive robot, an arm manipulated by an intuitive skin and voice controlled mechanisms. Another attraction was the multi-user health kiosk, a student-designed project from a senior project course taught by Dr. Dan Siewiorek at the Human Computer Interaction Institute at CMU. The kiosk enables users to quickly transmit vital signs to a remote caregiver or clinician.



Dr. Brewer and the Intuitive robot.

QoLT's goal of attending the show is to not only raise awareness of the center and its goals, but also recruit industry partners to assist in the objective of receiving sustainable funding after the course of the National Science Foundation grant period. According to this benchmark, the show was a success; several large and small companies ranging from powerhouse retailers to others interested in technology transfer opportunities inquired about visits to CMU and Pitt.

This is HERL's second year featuring up-and-coming technology designed to increase the independence of persons with disabilities at CES. Last year's QoLT Booth featured HERL's Self-Tuning Environment, a modular smart home unit which adapts to a user's preferences via radio frequency identification cards. —*Mary Goldberg*

Newly Funded Grants

Douglas J. Weber, PhD, was recently awarded a VA Merit Review grant, B7143R, for the project entitled “Enhancement of Motor Cortex Activity in Persons with Spinal Cord Injury.”

Alicia M. Koontz, PhD, was recently awarded a VA Merit Review grant, B7149I, for the project entitled “Biomechanical Validation of the Transfer Assessment Instrument (TAI).”



Athletes compete in basketball at the 2010 National Veterans Wheelchair Games in Colorado Springs.

A Note from the Editor

Hi! Yes, that goofy-looking fellow over to the right is me, Michael Lain, your new editor. I realize I have some big shoes to fill. Christine Heiner, the previous editor, was as thorough and experienced as a person can be. Although I was a writer and editor in my previous position before I joined HERL in December, I look at Christine’s output with a sense of awe. I could do no better than to emulate her going forward.



As a greenhorn, I’d love to really get to know you, the reader. You are, after all, the entire reason that the newsletter exists in the first place! What do you enjoy about the HERL newsletter? What would you like to see more of? What can we do better? I’d also really like to know your opinions on HERL’s online presence. For example, if we posted HERL news to a blog, would you read it? Or would you “like” us on Facebook?

So I invite you to get in touch. I’m thrilled and honored to have joined the HERL team, and I look forward to communicating with you some more!

Recent HERL Publications

Cooper RA, Koontz AM, Ding D, Kelleher AR, Rice I, Cooper RM, Manual Wheeled Mobility: Current and Future Developments from the Human Engineering Research Laboratories, **Disability and Rehabilitation**, pp. 2210-2221, Vol. 32, No. 26, June 2010.

Jan YK, Brienza DM, Boninger ML, Brenes G, Comparison of Skin Profusion Response to Alternating and Constant Pressures in People with Spinal Cord Injury, **Spinal Cord**, June 2010, <http://www.nature.com/sc/journal/vaop/ncurrent/abs/sc201058a.html>.

Dicianno BE, Fairman AD, Juengst SB, Braun PG, Utilizing The Spina Bifida Lifecourse Model in Clinical Practice: An Interdisciplinary Approach, **Pediatric Clinics of North America**, pp. 945-957, Vol. 57, No. 4, August 2010.

Fairman AD, Thibadeau J, Dicianno BE, Parmanto B, Implementing a Specialty Electronic Medical Record to Document a Life course Developmental Model in Spina Bifida, **Pediatric Clinics of North America**, pp. 959-971, Vol. 57, No. 4, August 2010.

Swanson M, Dicianno BE, Physiatrists and Developmental Pediatricians Working Together to Improve Outcomes in Children with Spina Bifida, **Pediatric Clinics of North America**, pp. 973-981, Vol. 57, No. 4, August 2010.

Collinger JL, Impink BG, Ozawa H, Boninger ML, Effect of an Intense Wheelchair Propulsion Task on Quantitative Ultrasound of Shoulder Tendons, **Physical Medicine and Rehabilitation**, pp. 920-925, Vol. 2, No. 10, October 2010.

Karmarkar A, Collins DM, Kelleher A, Ding D, Oyster M, Cooper RA, Manual Wheelchair-Related Mobility Characteristics of Older Adults in Nursing Homes, **Disability and Rehabilitation: Assistive Technology**, pp. 428-437, Vol. 5, No. 6, 2010.



Human Engineering Research Laboratories



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

Rory A. Cooper, Ph.D.
Director

Michael L. Boninger, M.D.
Medical Director

Jonathan Pearlman, Ph.D.
Associate Director of Engineering

Alicia Koontz, Ph.D., RET
Associate Director for Research Capacity Building

Brad Dicianno, M.D.
Associate Medical Director

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

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

E-mail any comments, corrections, or questions concerning
the newsletter to the editor, Michael Lain, at:
Email: mil72@pitt.edu

www.herlpitt.org

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How would you like to get the news?

We're thinking of new ways to communicate with you—and with the world at large. So we're very interested in hearing from you about ways that you'd like to hear from us! Some questions that we're particularly interested in finding the answers to are:

How often do you read the newsletter on our website?

Would you read a HERL blog if it was updated often?

Do you use Facebook? If so, how frequently?

If you'd like to answer these questions or share your opinions, contact Michael Lain at **412-954-5290** or **mil72@pitt.edu**.