



## Fall Educational Outreach Activities

This fall HERL students and faculty participated in two important educational outreach activities: the Tech-Link Lego League Robotics team and the 2006 Sci-Tech Spectacular.

Since 2002 HERL has worked with Tech-Link to encourage all children, especially those with disabilities, to take an interest in technology through the FIRST Lego League's annual robotics competition. Team members work alongside engineers and technicians to design a robot built from Legos and controlled by a small computer and compete in the regional competition coordinated by Carnegie Mellon University's Robotics academy.

This year's event, "NANO Quest", was held on December 2 and two HERL/Tech-Link mentored teams, the Angstrom Androids and the Micro Maniacs, competed. HERL students Garrett Grindle,

Michelle Sporer, Candice Winful, and Joe Olson volunteered throughout the fall to prepare the teams for the competition.

HERL faculty members Diane Collins, PhD and Ding Dan, PhD along with RST Instructor

and Tech-Link Executive Director Sondra Balouris Brubaker participated in the 2006 Sci-Tech Spectacular on October 19 at Carnegie Science Center. The program is an interactive festival of what's cool and cutting-edge

in science and technology in the Pittsburgh region and beyond. The group presented on robotics, information technology, and biomedical and rehab engineering and demonstrated devices from the Quality of Life Engineering Research Center.

-Christine Heiner



*Drs. Diane Collins and Dan Ding at the Sci-Tech Spectacular on October 19*

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## HERL Holds 7th State of the Science Workshop and Says Farewell to Workshop Coordinator

HERL held its 7th State of the Science Workshop on November 17 at Walter Reed Army Medical Center. This latest workshop focused on Spinal Cord Injury. The event featured many speakers from HERL/University of Pittsburgh, Walter Reed, and other VA Centers of Excellence from across the Country. Over 100 people attended the workshop and earned continuing education credits.

The great success and popularity of these workshops are greatly credited to Amie Struble, who has been our Research and continuing education Coordinator since 2004. Amie is leaving the lab to move back to her hometown of Peoria, IL with her

husband, who just completed graduate school at Carnegie Mellon University. Amie has worked tirelessly at coordinating all activities associated with the workshops and will be sadly missed by all those who have had the pleasure of working with her over the last two years.

-Christine Heiner



*HERL said goodbye to Research Coordinator Amie Struble this winter. Amie was the driving force behind the State of the Science workshops for 2 years*

## CURRENT RESEARCH ABSTRACTS

### Investigation of the Performance of an Ergonomic Handrim as a Pain-Relieving Intervention for Manual Wheelchair Users

Alicia M. Koontz, Ph.D., RET, Yusheng Yang, M.A., David S. Boninger, Ph.D., John Kanaly, B.S., Rory A. Cooper, Ph.D., Michael L. Boninger, M.D. Dieruf K, Ewer L

Full article published in *Assistive Technology*, pp. 123-143, Vol. 18, No. 2, 2006.

This is our first journal article co-authored with our industry sponsor, Three Rivers Holdings. Three Rivers Holdings sells the Natural-Fit Pushrim, as well as 2 other assistive devices developed at HERL, the GameCycle and the SmartWheel. For more information, visit [www.3rivers.com](http://www.3rivers.com).

**Purpose of the Work.** Manual wheelchair users commonly experience hand and wrist pain that is associated with the repetitive stress of propulsion. The goal of this research was to examine the effect of an ergonomic handrim that was designed to provide for a more optimal fit to the hand thereby reducing hand and wrist pain and improving the function of manual wheelchair users.

**Subjects/Procedures.** Three studies were conducted to determine the effectiveness of the commercially-available Natural-Fit™ (NF) handrim. The first study involved a biomechanical analysis of propulsion comparing two handrims, the NF and a standard metal handrim. Ten wheelchair users with paraplegia were tested before and after a 2-week practice period using the NF handrim. In the second and third studies, a combined total of 128 manual wheelchair users who had replaced their standard handrim with the NF and were using it over 6 months on average were asked about reduction in the severity of hand or wrist pain since using the NF (both studies) and whether using the NF made performing various activities of daily living easier (third study only).

**Results.** The first study showed that wheelchair users used less grip force with the NF handrims compared to the standard handrims. The second study

revealed that 85% of wheelchair users reported less hand pain and 80% reported less wrist pain. The third study confirmed the results of the second study for reduction in pain severity and also found that wheelchair users perceive certain activities of daily living to be less difficult since using the NF handrim on their wheelchair for an extended period of time.



*The Natural Fit Handrim*

**Relevance to Wheelchair Users.** Use of an ergonomic handrim likely alters the biomechanics of propulsion enough to result in a reduction of hand and wrist pain. The NF handrim should be considered among other conservative options for the treatment and prevention of carpal tunnel syndrome.

*-Alicia Koontz, PhD*

### Sacramento Researchers Publish Journal Article on GameCycle

Researchers from the University of California Davis and Shriners Hospital for Children Northern California, Sacramento, published a journal article in the *Journal of Spinal Cord Medicine* on the GameCycle exercise device, which was developed at HERL. A group of 8 adolescents with Spina Bifida tried the GameCycle in their homes for 4 months. The researchers concluded that the Gamecycle was an enjoyable, motivating, and aerobically effective exercise device among the adolescents.

Widman LM, McDonald CM, Abresch RT, Effectiveness of an Upper Extremity Exercise Device Integrated with Computer Gaming for Aerobic Training in Adolescents with Spinal Cord Dysfunction, *Journal of Spinal Cord Medicine*, pp. 363-370, Vol. 29, No. 4, 2006.

## CURRENT RESEARCH ABSTRACTS

### Surface Electromyography Activity of Trunk Muscles During Wheelchair Propulsion

Yu-Sheng Yang, PhD, Alicia M, Koontz PhD, RET, Ronald J, Triolo PhD,  
Jennifer Mercer, BS, and Michael L. Boninger MD

Full article published in *Clinical Biomechanics*, pp. 1032-1041, Vol. 21, No. 10, October 2006.

**Purpose of the Work:** Spinal cord injury (SCI) can have adverse effects on posture and function in a wheelchair. This study investigated abdominal and back muscle activity during wheelchair propulsion. As people with SCI have paralysis affecting these muscle groups, we conducted this study with able-bodied individuals. The purpose of collecting information on muscle activity was to determine the amount of electrical stimulation that may be required to obtain normal functioning of these muscles in persons with SCI who propel manual wheelchairs.

**Subjects/Procedures:** Fourteen able-bodied participants (11 men, 3 women) enrolled in the study. Abdominal and back muscle activity was recorded using electromyography. Participants propelled a wheel-

chair on a roller system at 2 mph, 4 mph and from rest to their maximum speed.

**Results:** Abdominal and back muscles both contracted throughout propulsion but were most active just prior to and immediately upon contacting the pushrim.

**Relevance to Wheelchair Users:** This study provides an indication of the amount of muscle effort needed for the different stages of propulsion. This information will be used to design a pattern of electrical stimulation for persons with SCI that will be used to support their posture and propel their wheelchair with greater ease.

-Alicia Koontz, Ph.D.

## HERL PUBLICATIONS

Frost KL, Bertocci GE, Wassinger CA, Munin MC, Burdett RG, Fitzgerald SG, [Isometric Performance Following Total Hip Arthroplasty and Rehabilitation](#), *Journal of Rehabilitation Research and Development*, pp. 435-444 Vol. 43, No. 4, July/August 2006.

Yang Y, Koontz AM, Triolo RJ, Mercer J, Boninger ML, Surface Electromyography Activity of Trunk Muscles During Wheelchair Propulsion, *Clinical Biomechanics*, pp. 1032-1041, Vol. 21, No. 10, October 2006.

Koontz AM, Yang Y, Boninger DS, Kanaly J, Cooper RA, Boninger ML, Dieruf K, Ewer L, Investigation of the Performance of an Ergonomic Handrim as a Pain-Relieving Intervention for Manual Wheelchair Users, *Assistive Technology*, pp. 123-143, Vol. 18, No. 2, 2006.

Cooper RA, A Call to Action, *Paraplegia News*, p. 74, Vol. 60, No. 10, October 2006.

**Designing Smart Homes**, J.C. Augusto and C.D. Nugent, Editors, Springer-Verlag Berlin Heidelberg, 2006.  
Plans and Planning in Smart Homes, R. Simpson, D. Schreckenghost, E.L. Lopresti, N. Kirsch, pp. 71-84.

**Encyclopedia of Biomaterials and Biomedical Engineering**, Gary Wnek and Gary Bowlin, *Editors*, Taylor and Francis, 2006.

Wheeled Mobility: Wheelchairs and Personal Transportation, J.L. Pearlman, R.A. Cooper

**Wiley Encyclopedia of Biomedical Engineering**, John Wiley and Sons Inc., Hoboken, NJ, 2006.

Rehabilitation Engineering: An Overview, R.A. Cooper, D. Ding, R. Cooper, E.J. Wolf, S.D. Algood, T.A. Corfman, A.J. Rentschler, M.L. Boninger, E.S. Chaves

Wheelchair Engineering, R.A. Cooper, D. Ding, A.M. Kwarciaak, R. Cooper, S. Guo, D.M. Spaeth, E. Zipfel, A. Kelleher, M.L. Boninger

Rehabilitation Biomechanics, A.M. Koontz, J.L. McCrory, R. Cham, Y. Yang, M. Wilkenson

Intelligent Mobility Aids, R.C. Simpson, A.J. Rentschler

Spinal Cord Stimulation System, S. Guo, K. Brown, G. Grindle, E. Zipfel

## Current Events/ Announcements

Little Caesars® Pizza announced its unique Little Caesars Veterans Program, which provides **franchise business opportunities to qualified, honorably discharged veterans transitioning to civilian life or seeking a career change.**

Little Caesars has many prime locations currently available and the Little Caesars Veterans Program provides the following benefits for all veterans:

- Franchise fee reduced by \$5,000 for the first store
  - Favorable financing benefits
  - \$5,000 credit on the initial equipment order
- Additionally, service-disabled veterans are eligible for enhanced benefits including:
- Franchise fee (\$20,000) waived for the first store
  - Additional financing options and benefits (can be approximately \$20,000)
  - \$10,000 credit on the initial equipment order
  - Grand Opening support from leading national companies (approximately \$18,000)

The total benefit for service-disabled veterans is approximately \$68,000

The Center for Veterans Enterprise (part of the Department of Veterans Affairs), Marine For Life (an organization that helps Marines and Sailors transition to civilian life), and the International Franchise Association (through its VetFran program) are points of contact for the Little Caesars Veterans Program.

They can provide information about the requirements and qualifications of becoming a Little Caesars franchisee.

Applications will be received through December 31, 2008.

For more information about prime franchising opportunities with Little Caesars, the Little Caesars Veterans Program, and for images, visit

<http://www.littlecaesars.com/veterans>

For more information about the Center for Veterans Enterprise (CVE), visit [www.vetbiz.gov](http://www.vetbiz.gov), or call 866.584.2344. For more information about Marine For Life, visit [www.M4L.usmc.mil](http://www.M4L.usmc.mil), or call 866.M4L.USMC.

For more information about VetFran, visit [www.franchise.org](http://www.franchise.org) under "Programs & Services."

## ACCOMPLISHMENTS AND AWARDS



Alicia Koontz, Ph.D.

**Michael Boninger, MD** was inducted into the National Spinal Cord Injury Association Hall of Fame for his research in Assistive Technology on October 30.

**Alicia Koontz, Ph.D., RET** was invited to speak at Northwestern University's Department of Physical Therapy and Human Movement Sciences Research Seminar Series in November.

This was Dr. Koontz's first invited lecture.

**Rory Cooper, PhD.** was the keynote speaker at the National Telerehabilitation Service System Assistive Technology Exposition at the Hiram G. Andrew Center on November 15.



This year HERL alumni **Carmen Digiovine, Ph.D.** and **Sean Shimada Ph.D.** started up a new rehabilitation science and technology firm called 6 Degrees of Freedom. 6 Degrees of Freedom provide clinical and assistive technology services to people with disabilities in educational, residential, workplace, outpatient, and community settings. For more information about the company, please visit [www.6degreesoffreedom.com](http://www.6degreesoffreedom.com) or contact them toll free at 866-451-6363.

This year a new site debuted on the web, AVBI: American Veterans with Brain Injuries (<http://avbi.org/>). This **free site** was organized as a grassroots effort, **offering support to vets with brain injuries** through their web site, online forum, live chat, and public awareness program. The AVBI web site offers personal stories, resources, and announcements of services available to these American Veterans. There is an online forum for participants to ask questions and share information. The site also features AVBI chat for live peer support. The AVBI public awareness program will bring forth to the American public the difficult issues brain injured veterans and their families face.

## News from the Department of Physical Medicine and Rehabilitation

Ross D. Zafonte, DO, Professor and Chair, Department of Physical Medicine and Rehabilitation, is the 38<sup>th</sup> recipient of the Walter J. Zeiter Lecture Award. He is the first doctor of osteopathic medicine to be honored with this award. The award was presented in Honolulu, Hawaii on November 10<sup>th</sup> of this year at the AAPM&R Annual Meeting.

The lectureship is named in honor of Walter J. Zeiter, MD, who served as executive director of AAPM&R and the American Congress of Rehabilitation Medicine from 1939–1959. Each year this lectureship is awarded to a psychiatrist who shared Dr. Zeiter's qualities of statesmanship, scholarship, executive leadership, and warm friendship. *-Mary Synnott*

## News from the Department of Rehabilitation Science and Technology



The U.S. Department of Education's National Institute on Disability and Rehabilitation Research has continued to fund the Rehabilitation Engineering Research Center on Wheel-

chair Transportation Safety (RERC WTS) for an additional five years. The Center was awarded to a partnership headed by the University of Michigan Transportation Research Institute and in collaboration with the University of Pittsburgh. Patricia Karg, of the Department of Rehabilitation Science and Technology at the University of Pittsburgh, will act as Associate Director of the Center.

The partnership of investigators will conduct research and development in six project areas, ranging from developing solutions for forward-facing and rear-facing wheelchair passenger stations in large accessible transit vehicles, to investigating issues of school bus transportation for children in wheelchairs, to improving frontal- and rear-crash protection for wheelchair occupants in private vehicles.

In addition, the RERC WTS will disseminate information, train future researchers, transfer technology concepts to manufacturers, and develop and revise voluntary industry standards. *-Tricia Karg*

## HERL in the Community

HERL was a bronze sponsor of the **Hope Network's Las Vegas Night** benefiting the Steel City Starz women's wheelchair basketball team on Friday, November 17, 2006 at the Chadwick in Wexford, Pa. Hope Networks' mission is to promote community integration and healthy lifestyles of persons with disabilities in Southwestern PA through education and sports/recreation programs and services.



On Friday, December 15<sup>th</sup> 2006, members of the HERL research team participated in an **event hosted for outpatients and inpatients with the University of Pittsburgh Physicians Department of Physical Medicine and Rehabilitation**. The event was held at the Institute for Rehabilitation and Research located at the UPMC South Side hospital.

Representatives from local agencies were on hand to speak about the work they do to the patients and families who attended the event. Marvin Vought of the Physically Challenged Bow Hunters of America spoke about the various opportunities for hunting provided through PCBA. The mission of PCBA is "to introduce adaptive bow-hunting to individuals with physical disabilities." More information can be found online at [www.pcba-inc.org](http://www.pcba-inc.org). Another local agency in attendance at the rehab event was the HOPE Network represented by John Sikora. The HOPE Network's mission is "to promote community integration for individuals with various cognitive and/or physical challenges." Additional information can be obtained at [www.hopenetwork-pa.org](http://www.hopenetwork-pa.org). William Fertig spoke about the work and mission of the National Spinal Cord Injury Association ([www.spinalcord.org](http://www.spinalcord.org)). The NSCIA seeks to "enable individuals with spinal cord injury and disease to achieve their highest level of independence, health and personal fulfillment by providing resources, services, and peer support." Finally, Ruby Wilkosz introduced guests to Working Order ([www.workingorder.org](http://www.workingorder.org)) whose mission is "to support employment of individuals with various disabilities through entrepreneurship and community partnership."

The research team from HERL was pleased to have the opportunity to meet the patients and families who were in attendance! *-Emily Teodorksi*



## HERL IN THE MEDIA

**VA Research Currents, August 2006, p. 1:** Veterans Participate in Research at Wheelchair Games

[http://www.research.va.gov/resources/pubs/docs/va\\_research\\_currents\\_aug\\_06.pdf](http://www.research.va.gov/resources/pubs/docs/va_research_currents_aug_06.pdf)

**National Center on Physical Activity & Disability Newsletter, August 2006 :** Rectech's National Users with Disabilities Group Exercising (NUDGE): Gamecycle Exercise Device

<http://www.ncpad.org/newsletter/newsletter.php?letter=55&section=773>

**NSCIA SCI E-News, August 13, 2006:** Hall of Fame 2006 Nominees: Assistive Technology - Michael Boninger

<http://www.spinalcord.org/news.php?dep=13&page=53&list=790>

**CAST Website, August 21, 2006:** NSF Awards \$15 Million Grant to Establish Research Center

<http://www.agingtech.org/announcement.aspx?id=138>

**The Parascope, September/October 2006, p. 1:** CMU and Pitt Establish Quality of Life Technology Center

**SSTI Weekly Digest, September 4, 2006:** NSF Pumps \$75M into New ERCs

<http://www.ssti.org/Digest/2006/090406.htm#NSF>

**Pittsburgh Business Times, September 22, 2006, pp. 17-24:** The Mechanical Companion

**VA Research Currents, October 2006:** Recent Publications and Publications by VA Investigators: Alicia Koontz

[http://www1.va.gov/resdev/resources/pubs/docs/va\\_research\\_currents\\_oct\\_06.pdf](http://www1.va.gov/resdev/resources/pubs/docs/va_research_currents_oct_06.pdf)

**Paraplegia News, October 2006, p. 60:** Games Power

**The Supercentarian Research Foundation, October 5, 2006:** Pittsburgh Selected as Home of Organization Formed to Combat Aging Process

**Pittsburgh Business Times, October 6, 2006, p. 2:** Corrections and Amplifications: Rory Cooper

**Pittsburgh Post Gazette, October 2006:** Bits and Bytes: ERC Open House

**Paraplegia News, November 2006, pp. 46-47:** Don't Hate the Wheels

**The Tartan, November 13, 2006:** Helpful Devices: The Assistive Technology Field Continues to Rapidly Expand

<http://www.thetartan.org/2006/11/13/scitech/assistive>

## NEW HERL GRANTS

**“Nonlinear Filtering of Athetoid Movement.”** Principle Investigator: Cameron Riviere, PhD, Carnegie Mellon University (HERL Co-Investigators: Rory Cooper, PhD, Dan Ding, PhD). National Institutes of Health.

**“IRRE: International Training and Research on Assistive Technologies for India and other Low-Income Countries.”** Principle Investigator: Rory Cooper, Ph.D. Supplement to the American Student Placement and Internships in Rehabilitation Engineering (ASPIRE), National Science Foundation, \$22,063, May 1, 2006-April 30, 2007.

**“Investigation of Transfer Techniques to Minimize Shoulder Joint Loading.”** Principle Investigator: Alicia Koontz, Ph.D. Dept. of Veterans Affairs, Rehab Research & Development Service, \$370,550, October 1, 2006-September 30, 2009.

## Interested in participating in a HERL Research Study?

If you are interested in participating in any of these studies, please contact the HERL Clinical Coordinators: Annmarie Kelleher, Emily Teodorski, or Michelle Tolerico at 412-365-4850

### India Accessibility Questionnaire

Principal Investigator: Jon Pearlman, MS

You are eligible if you are over the age of 18, have internet access, and are any of the following:

- An engineer who designs mobility equipment
- A clinician involved in providing mobility equipment
- A person who designs or modifies homes for accessibility
- A person who is otherwise knowledgeable of the accessibility needs of wheelchair users
- You are invited to be a member of an online research group to view photographs of Indian living environments and rate them for power wheelchair accessibility.

- If you are interested and meet the eligibility requirements, you will be asked to discuss the difficulty of adapting each environment for a power wheelchair, and what adaptations a power wheelchair would need to function in the environment.
- This will take from 0.5–1 hour.

*If you are interested, please visit:*

[http://www.herlpitt.org/WEB\\_STUDIES/India/index.php](http://www.herlpitt.org/WEB_STUDIES/India/index.php)

Registration key: 'reg'

### The Application of Isometric Controls to Assist Individuals with Multiple Sclerosis in Driving Electric Powered Wheelchairs

Principal Investigator: Donald M. Spaeth, PhD

The purpose of this research study is to evaluate wheelchair joysticks. You may be asked to complete a total of 3 study visits during which you will complete several computer tasks as well as an indoor driving course.

You may be eligible to participate if...

- You are between the ages of 18 and 80
- You have been diagnosed with multiple sclerosis
- You use an electric powered wheelchair

Participation in this study is voluntary and all information gathered will be strictly confidential.

You will be compensated \$40 for each study visit.

**These are just some of the studies we're presently recruiting for. For additional studies and updates on studies you may be able to participate in, visit [www.herlpitt.org/research.htm](http://www.herlpitt.org/research.htm), and click on STUDIES WE'RE RECRUITING FOR**



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the newsletter to the editor, Christine Heiner at:  
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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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## 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.

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