HERL Newsletter

News from the Human Engineering Research Laboratories VOL. 12, NO. 2 · JULY 2013

A Family's Love is Good Medicine

VA Pittsburgh Opens Fisher House

On December 4, 2012, the Pittsburgh VA Fisher House – currently the only Fisher House in Pennsylvania – was dedicated. Fisher Houses provide free temporary lodging to out-of-town Veteran or Military Service families whose loved ones are currently receiving medical treatment. Pittsburgh's Fisher House can house up to ten families.

Heather Frantz, manager of the Pittsburgh VA's Fisher House, says "The Pittsburgh Fisher House is an enormous comfort for our Veterans' families and to our Veterans. Having somewhere beautiful and welcoming to stay during such a stressful time is an invaluable necessity for these families. So many of them are overwhelmed by the beauty and atmosphere of the home and the people within that pull together to offer support to one another. It truly is a home away from home for the families when they need it most."

Like the other 60 Fisher Houses on military installations and VA medical centers around the country, the Pittsburgh Fisher House was donated to the US Government by the Fisher family and the Fisher House Foundation, which was founded by Zachary and Elizabeth Fisher in 1990. Since 1990, Fisher Houses have served more than 180,000 families, saving them over $200 million in lodging and transportation costs. Fisher Houses depend on volunteers to help support daily operations, and on donations to provide ongoing support. Monetary donations are always appreciated, but donations of household items are also needed.

The Fisher House Foundation also runs several programs for Military and Veteran families, such as Hero Miles, which provides free airline tickets; Hotels for Heroes, which provides free lodging if Fisher Houses aren't available; and Scholarships for Military Children and Heroes' Legacy Scholarships for the children of fallen and disabled service members.

For more information about the Pittsburgh VA's Fisher House, see **http://www.pittsburghfisherhouse.org/**. For more information about Fisher Houses nationwide and the Fisher House Foundation, see **http://www.fisherhouse.org/**.

FISHER HOUSE
VA Pittsburgh Healthcare System

Exterior of the Fisher House.

Above: *The International Paralympics logo.*
Left: *Wheelchair racer Josh Roberts trains for the 2008 Beijing Paralympics.* (Courtesy US Air Force)

Because Everyone Can Compete

The Story of the Paralympics Movement

Think that the thrill and glory of international competition are finished once the Olympics are over? Think again! Thanks to the Paralympics movement, amateur sports excellence continues after the Olympics, featuring the world's finest athletes with disabilities. The Paralympic Games are after each Olympic Games at the same location, winter and summer. The next Winter Paralympic Games will be held March 7-16, 2014, in Sochi, Russia.

The Paralympics, organized by the International Paralympic Committee, is a movement parallel and equal to the Olympics. The two events are not affiliated, but each organizing committee works cooperatively and shares delegates. This parallel affiliation is the reason for the name "Paralympics," *pará* being the Greek work for "beside."

The Paralympics Movement can be traced back to the end of World War II in Britain, when Dr. Ludwig Guttman searched for ways to help his patients with disabilities recuperate, ultimately using sports and recreational activities with great success. Dr. Guttman later organized the first sports competition for Veterans with spinal cord injuries, which coincided with the 1948 London Olympics. In 1952, the competition became international as Dutch Veterans competed against British Veterans.

The movement for an international competition grew quickly, and the first official Paralympic Games was held in Rome in 1960. In 1976, the first Winter Paralympic Games took place in Örnsköldsvik, Sweden. By 1988, the Olympics and Paralympics entered into an agreement

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Current Research Abstracts

Collinger JL, Boninger ML, Bruns TM, Curley K, Wang W, Weber DJ, "Functional Priorities, Assistive Technology, and Brain-Computer Interfaces after Spinal Cord Injury," *Journal of Rehabilitation Research and Development*, pp. 145-160, Vol. 50, No. 2, 2013.

SUMMARY: ***A survey of wheelchair users showed bladder/bowel control, walking, and arm/hand function topped QoL priorities.***

Spinal cord injury (SCI) often affects a person's ability to perform critical activities of daily living and can negatively affect his or her quality of life. Assistive technology aims to bridge this gap in order to augment function and increase independence. It is critical to involve consumers in the design and evaluation process as new technologies such as brain-computer interfaces (BCIs) are developed. In a survey study of 57 veterans with SCI participating in the 2010 National Veterans Wheelchair Games, we found that restoration of bladder and bowel control, walking, and arm and hand function (tetraplegia only) were all high priorities for improving quality of life. Many of the participants had not used or heard of some currently available technologies designed to improve function or the ability to interact with their environment. The majority of participants in this study were interested in using a BCI, particularly for controlling functional electrical stimulation to restore lost function. Independent operation was considered to be the most important design criteria. Interestingly, many participants reported that they would consider surgery to implant a BCI even though noninvasiveness was a high-priority design requirement. This survey demonstrates the interest of individuals with SCI in receiving and contributing to the design of BCIs.

Kamaraj DC, Dicianno BE, Cooper RA, "Acute Mountain Sickness in Athletes with Neurological Impairments," *Journal of Rehabilitation Research and Development*, pp. 253-262, Vol. 50, No. 2, 2013.

SUMMARY: ***Mountain sickness is found more often in individuals with neurological impairments than without.***

Acute mountain sickness (AMS) is a symptom complex noticed commonly among high altitude travelers. The occurrence of AMS depends on multiple factors that have been studied extensively. However, AMS in individuals with neurological impairments has not been considered in detail. A total of 168 subjects, including active controls, inactive controls, and those with spinal cord injury (SCI), multiple sclerosis, and traumatic brain injury (TBI), were studied at the National Veterans Winter Sports Clinic in Snowmass, Colorado, from 2007 to 2009 for the occurrence of AMS. Lake Louise Score was used to quantify symptoms. A higher than anticipated occurrence of AMS (42.85%) among the study population was noted, with significantly higher Lake Louis Scores among athletes with neurological impairments. Disability group, prior history of AMS, and prior occurrence of headache at high altitude could be used as predictors for the development of AMS symptoms. More research is warranted specifically targeting the interaction between factors affecting AMS and the pathophysiology of neurological impairments like SCI and TBI to further our understanding about prophylactic medications and treatments for AMS, especially because many military personnel with neurological impairments continue on Active Duty.

Wang W, Collinger JL, Degenhart AD, Tyler-Kabara EC, Schwartz AB, Moran DW, Weber DJ, Wodlinger B, Vinjamuri R, Ashmore RC, Kelly JW, Boninger ML, "An Electrocorticographic Brain Interface in an Individual with Tetraplegia," *PLoS One*, e55344, Vol. 8, No. 2, 2013.

SUMMARY: ***An individual with tetraplegia was able to control 3D cursor movement with brain activity only.***

Brain-computer interface (BCI) technology aims to help individuals with disability to control assistive devices and reanimate paralyzed limbs. Our study investigated the feasibility of an electrocorticography (ECoG)-based BCI system in an individual with tetraplegia caused by C4 level spinal cord injury. ECoG signals were recorded with a high-density 32-electrode grid over the hand and arm area of the left sensorimotor cortex. The participant was able to voluntarily activate his sensorimotor cortex using attempted movements, with distinct cortical activity patterns for different segments of the upper limb. Using only brain activity, the participant achieved robust control of 3D cursor movement. The ECoG grid was explanted 28 days post-implantation with no adverse effect. This study demonstrates that ECoG signals recorded from the sensorimotor cortex can be used for real-time device control in paralyzed individuals.

Another Patent for HERL Team

On February 19, 2013, the United States Patent Office awarded Patent No. 8,376,463 to HERL-affiliated inventors Rory A. Cooper, PhD; Jonathan L. Pearlman, PhD; Todd Hargroder; Eun-Kyoung Hong; Hsin-Yi Liu; Hongwu Wang; and Benjamin A. Salatin for their user adjustable wheelchair backrest mounting hardware design.

From the patent:

"The present invention is a lightweight, durable, adjustable, backrest for ultralight manual wheelchairs. Lightweight material can include composites for a rigid backrest for promotion of a healthier and more functional interface. Angle adjustment can be any desired range such as a range from -5 degree to 55 degrees (i.e. 85 degrees to 145 degree with respect to horizontal with the seat). No tools are necessary for any of the angle adjustments. The backrest has a horizontal adjustment (fore-aft) that can be any desired range such as 1 inch. The height selection depends on the length of the wheelchair frame tubes.

"The present invention improves the ease and simplicity of adjusting the backrest by or for the user, and also enhances its commercial readiness. The present invention can be retrofitted onto a wide range of ultralight wheelchairs."

Current Research Abstracts

Rice IM, Phlig RT, Gallagher JD, Boninger ML, "Handrim Wheelchair Propulsion Training Effect on Overground Propulsion Using Biomechanical Real Time Visual Feedback," *Archives of Physical Medicine and Rehabilitation*, pp. 256-263, Vol. 94, No. 2, February 2013.

SUMMARY: *Multimedia video and real-time feedback improved wheelchair users' propulsion techniques.*

Objective: To compare the effects of 2 manual wheelchair propulsion training programs on handrim kinetics, contact angle, and stroke frequency collected during overground propulsion.
Design: Randomized controlled trial comparing handrim kinetics between 3 groups: a control group that received no training, an instruction-only group that reviewed a multimedia presentation, and a feedback group that reviewed the multimedia presentation and real-time visual feedback.
Setting: Research laboratory.
Particpants: Full-time manual wheelchair users (N=27) with spinal cord injury living in the Pittsburgh area.
Interventions: Propulsion training was given 3 times over 3 weeks, and data were collected at baseline, immediately after training, and at 3 months.
Main outcome measures: Contact angle, stroke frequency, peak resultant force, and peak rate of rise of resultant force.
Results: Both feedback and instruction-only groups improved their propulsion biomechanics across all surfaces (carpet, tile, and ramp) at both target and self-selected speeds compared with the control group. While controlling for velocity, both intervention groups showed long-term reductions in the peak rate or rise of resultant force, stroke frequency, and increased contact angle.
Conclusions: Long-term wheelchair users in both intervention groups significantly improved many aspects of their propulsion technique immediately after training and 3 months from baseline. Furthermore, training with a low-cost instructional video and slide presentation was an effective training tool alone.

Toro ML, Koontz AM, Cooper RA, "The Impact of Transfer Setup on the Performance of Independent Wheelchair Transfers," *Human Factors*, pp. 567-580, Vol. 55, No. 3, June 2013.

SUMMARY: *ADA Accessibility Guidelines are currently insufficient in height and clear-space recommendations.*

Objective: The aim of this study was to determine how selected environmental factors affect transfers and to compare our results to the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
Background: Few data are available to support standards development related to transfers in the built environment.
Method: Participants were 120 wheeled mobility device (WMD) users who transferred to and from a modular transfer station that consisted of a height-adjustable platform with a lateral grab bar, optional obstacle to the transfer, and an optional height-adjustable front grab bar. Maximum and minimum vertical heights of the transfer surface, maximum gap distance between the WMD and transfer surface, grab bar use, and WMD space needs were recorded.
Results: The 95th percentile lowest and highest heights attained were similar to the median WMD seat-to-floor height (56 cm). We found that 42% (47/113) could not perform a transfer with the obstacle present. Participants transferred higher when the front grab bar was added to the setup ($p = .005$) and higher and lower with the front grab bar than without it when the obstacle was present in the setup ($p = .003$ and $p = .005$, respectively). We found that 95% of participants performed a transfer across an 8.9-cm gap. ADAAG recommendations fall short for the height and clear-space needs of the 50th-percentile WMD users.
Conclusion: Revisions concerning transfer heights, gaps, clear spaces, and grab bar heights are necessary to make transfers more accessible to WMD users.
Application: The data will be used to revise the guidelines related to transfers and to enable designers and engineers to create an environment that is more accessible.

HERL projects publicized during VA Research Week

VA Research Week was May 13-17 this year and HERL was in the local spotlight!

- On Monday, May 13, HERL researcher Hervens Jeannis was interviewed on WESA, Pittsburgh's NPR radio affiliate, about his Strongarm project. Listen to it online at **http://is.gd/wesavarw**
- On Tuesday, May 14, researcher Harshal Mahajan presented HERL's Cueing Kitchen and Kitchenbot projects and Jeannis presented Strongarm to CBS reporter Dave Crawley on Pittsburgh's KDKA News. Watch the video online at **http://is.gd/kdkavarw**
- The Beaver County Times profiled HERL research projects in their weekend edition, and also shot some video they posted online. Watch the videos on YouTube at **http://youtu.be/3tflyKugvZ0** and **http://youtu.be/9Mv19nVRPLo**

Hervens Jeannis and Strongarm on KDKA.

Groundbreaking BCI Research Article Published in the Lancet

Full citation: Collinger JL, Wodlinger B, Downey JE, Wang W, Tyler-Kabara EC, Weber DJ, McMorland AJC, Velliste M, Boninger ML, Schwartz AB, "High-Performance Neuroprosthetic Control by an Individual with Tetraplegia," *The Lancet*, pp. 557-564, Vol. 381, No. 9866, 16 February 2013.

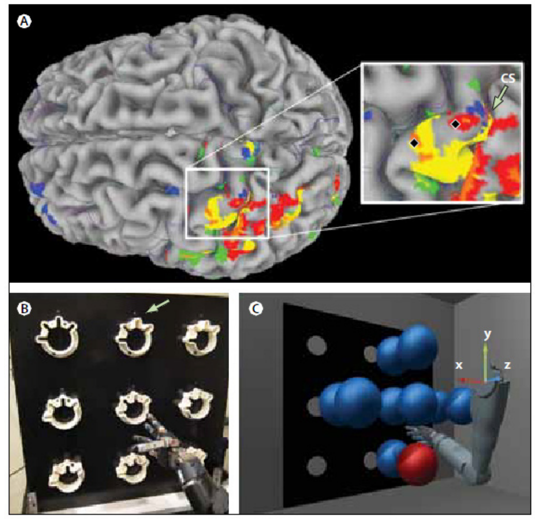
Summary: *Background Paralysis or amputation of an arm results in the loss of the ability to orient the hand and grasp, manipulate, and carry objects, functions that are essential for activities of daily living. Brain–machine interfaces could provide a solution to restoring many of these lost functions. We therefore tested whether an individual with tetraplegia could rapidly achieve neurological control of a high-performance prosthetic limb using this type of an interface.*

Methods: *We implanted two 96-channel intracortical microelectrodes in the motor cortex of a 52-year-old individual with tetraplegia. Brain–machine-interface training was done for 13 weeks with the goal of controlling an anthropomorphic prosthetic limb with seven degrees of freedom (three-dimensional translation, three-dimensional orientation, one-dimensional grasping). The participant's ability to control the prosthetic limb was assessed with clinical measures of upper limb function.*

Findings: *The participant was able to move the prosthetic limb freely in the three-dimensional workspace on the second day of training. After 13 weeks, robust seven-dimensional movements were performed routinely. Mean success rate on target-based reaching tasks was 91·6% (SD 4·4) versus median chance level 6·2% (95% CI 2·0–15·3). Improvements were seen in completion time (decreased from a mean of 148 s [SD 60] to 112 s [6]) and path efficiency (increased from 0·30 [0·04] to 0·38 [0·02]). The participant was also able to use the prosthetic limb to do skillful and coordinated reach and grasp movements that resulted in clinically significant gains in tests of upper limb function. No adverse events were reported.*

Interpretation: *With continued development of neuroprosthetic limbs, individuals with long-term paralysis could recover the natural and intuitive command signals for hand placement, orientation, and reaching, allowing them to perform activities of daily living.*

SUMMARY: *Why groundbreaking BCI research, when published in* The Lancet*, becomes even more groundbreaking.*



This article demonstrates the efficacy of a brain-computer interface in allowing a research subject with tetraplegia to control a prosthetic limb with a high degree of skill. This is the same project that was reported worldwide, was profiled in a segement of CBS' newsmagazine show *60 Minutes*, and received *Popular Mechanics* magazine's "Breakthrough Award."

The fact that this research was published in *The Lancet* indicates how groundbreaking and noteworthy it actually is. *The Lancet* is self-described as "the world's leading general medical journal and specialty journals in Oncology, Neurology and Infectious Diseases." *The Lancet*'s impact factor is huge: as of 2011, it was ranked second out of 153 journals in the general medicine category.

The Lancet was founded in 1823 in London by Thomas Wakley (1795-1862). It continues to publish in London today under the editorship of Dr. Richard Horton. It has been the journal of first publication for such breakthroughs as the antibacterial effects of penicillin, the linkage of thalidomide to birth defects, the description of Creutzfeldt-Jakob (aka "mad cow") disease, and the identification of the virus causing SARS.

Although journal articles are unavailable without a subscription, *The Lancet* is online at http://www.thelancet.com/.

Women Veterans and Service Members Subject of State of the Science *Symposium*

The State of the Science Symposium on "Medical Rehabilitation of Wounded, Injured, and Ill Women" was held at the Uniformed Services University of the Health Sciences in Bethesda, Maryland on May 8, 2013. There were over 120 uniformed and non-uniformed attendees at this symposium.

To start off the symposium, **Linda H. Weidow, RN CCM** and **Lindsey James Buglewicz, MS LRT/CTRS** of the WAR Program for the Wounded Warrior Battalion East at Camp Lejeune, gave a combined presentation about the care of female Wounded Warriors in the US Marine Corps' Wounded Warrior Regiment. Following this presentation, **COL Barbara A. Springer (USA Ret.), PT PhD OCS SCS** discussed musculoskeletal injuries in Military women.

Next, **Amy K. Wagner, MD** of the University of Pittsburgh's Department of Physical Medicine and Rehabilitation presented a talk entitled "State of the Science Concepts in Rehabilomics: Hormone Relevant Biomarkers in Rehabilitation Research." After this, **MAJ GEN Irene Trowell-Harris (USAF Ret.), RN EdD**, discussed her work as the director of the Center for Women Veterans in the Department of Veterans Affairs and detailed the coordination of health care for women Veterans.

During lunch HERL's own **Maria Milleville** spoke about the Experiential Learning for Veterans in Assistive Technology and Engineering (ELeVATE) program, which is designed to reintegrate Veterans into a college environment. (For more information on the program, see http://www.qolt.pitt.edu/veterans/.)

After lunch, **Rachel E. Cowan, PhD** of the Department of Neurosurgery & Miami Project to Cure Paralysis at the University of Miami Miller School of Medicine discussed the enhancement and preservation of maximal transfer and wheelchair propulsion activity in a presentation with the same title. **Lana McKenzie, RN BSN MBA CCM**, Associate Executive Director, Medical Services - Health Policy of the Paralyzed Veterans of America then presented an overview of the PVA's portfolio as it benefits women Veterans with spinal cord injuries. McKenzie was joined by **Sherman Gillums, Jr., MS**, the Associate Executive Director for Veterans Benefits at PVA.

Carol O'Brien, PhD, Chief of PTSD Programs at By Pines VA Healthcare System discussed the psychological aspects of women's healthcare. Finally, **Billie J. Randolph, PhD PT OCS**, deputy director of the Extremity Trauma and Amputation Center of Excellence at Fort Sam Houston gave a presentation entitled "Unique Considerations for Women with Traumatic Extremity Injuries and Amputations."

Dismissal took place at 1600 hours.

View videos, presentations, photos, and more from this symposium online at the HERL website: **http://herl.pitt.edu/rehabilitation-women**

Paralympics *(continued from page 1)*

of partnership, recently renewed through 2020, whereby the Paralympics would take place at the same venue and immediately follow the Olympics.

In the United States, U.S. Paralympics is a division of the U.S. Olympic Committee and is headquartered in Colorado Springs, CO.

On May 4, 2013 in Bonn, Germany, HERL Director Dr. Rory Cooper was awarded the 2013 Paralympic Scientific Award in recognition of his outstanding contributions to the Paralympic movement. Dr. Cooper joined a very select list of recipients, as this high honor has only been awarded every other year since 2005. He is the first Paralympic medalist and American scientist to receive this award. Dr. Cooper was a bronze medalist at the Seoul Paralympics in 1988.

Participatory Design at HERL

Ever wonder how some of the newest technology for people with spinal-cord injuries and other disabilities comes about? It's a detailed process that takes a lot of input and work from many different groups.

A traditional product design process includes the identification of user needs, design specification, concept development, concept selection, system design, prototyping, and testing. However, when designing assistive technology (AT) devices, many different user groups must be taken into account. Besides the primary end-users of the device, a number of other groups can be considered secondary endusers. These may include family members and/or friends, caregivers, teachers, social workers, occupational therapists, and medical personnel. Also, funding agencies that can include healthcare and social services departments and a range of non-governmental organizations are important stakeholders.

The design of AT products should not only follow the standard good design process but also consider the needs for design and satisfy primary users, secondary users, and purchasing organizations. Participatory action design (PAD) is an approach to the design, development, and assessment of technology that places an emphasis on active involvement of the intended users in the design and decision-making process. The Human Engineering Research Laboratories (HERL) at the University of Pittsburgh has adapted the PAD approach to develop a new participatory design model that will enable it to gather design feedback and guidance from users for all products in the development pipeline. The user participatory design (UPD) framework incorporates the traditional and PAD design processes.

The process starts with the preproject phase, identifying general and specific application and technology characteristics. User needs, target population characteristics, and barriers to adoption are identified. During the predevelopment phase, user-centered methods such as user observations, storyboarding, rich stimulus displays, and scenario testing are employed. All the information gathered from these methods is assembled to come up with the conceptual design, and performance objectives from a user's perspective with measurable outcomes are also developed.

The detail design, component development, design documentation, testing results, etc., are conducted during the user-centered design prototype phase. With the designed prototype, further work continues on functional performance verification, and with refinement the robust prototype is developed.

The performance, failure modes, and usability are tested in a laboratory environment, and technology refinements are completed based on the test results. A full evaluation of the system by prospective end users in the field is completed or friends, caregivers, to make sure the system meets or exceeds performance requirements. Finally, clinical trials are performed to prove efficacy and safety of the replicated system. At the end, regulatory clearances and engineering for manufacturing are applied for the final commercial product.

HERL applies the UPD framework throughout the entire product development process. The multifaceted dimensions ofthis framework allow it to integrate users, technology, environment, and economic elements into technology development.

Here is a quick look at three assistive robots being developed following the UPD framework.

PerMMA

The Personal Mobility and Manipulation Appliance (PerMMA) is a wheelchair with robotic arms that can be controlled by the wheelchair user, a remote helper via the Internet, or a combination of both. PerMMA will offer greater independence to individuals with mobility and upper-extremity impairments by allowing them to perform tasks in their home and in the community that would otherwise require the assistance of others. PerMMA is currently in the robust prototype phase, heading to the laboratory prototype phase.

MEBot

Mobility Enhancement Robotic Wheelchair (MEBot) is an intelligent robotic wheelchair. It features a movable central drive wheel that can reposition itself to simulate front, mid, or rear-wheel driving, two sets of independently moving smaller caster wheels, and internal sensing of weight distribution and inertia. All degrees of freedom are controlled by a custom embedded system and available to the rider through a joystick, switch and keypad interfaces.

MEBot (previously called PerMMA Generation 2) climbs curbs, inches across ice, and tackles other challenging terrain manually or independently. It's currently in the user-centered design prototype phase, heading to the robust prototype phase.

Strong Arm

Strong Arm is a robotic manipulator that can lift and hold a 250-pound payload and can be mounted on a power wheelchair. The goal of Strong Arm is to facilitate transfers such as from a wheelchair to a bed. It can also be used to move everyday heavy objects such as a gallon of milk, pot of water or turkey. It's currently in the user-centered design prototype phase heading to robust prototype.

By using the UPD framework during the design and development of PerMMA, MEBot, and Strong Arm, HERL has been able to shift users from a more reactive role (where they respond to products via focus groups and field trials) to a more active role, where they are providing guidance during many steps of the design process. This approach could help refine the quality and usability of assistive technology currently being developed, and help facilitate the product development cycle.

- Hongwu Wang

Meet a HERL Researcher: Lynn Worobey

HERL graduate student, Lynn Worobey, earned her PhD in Biomedical Engineering. Lynn presented her dissertation, "Freehand Three-Dimensional Ultrasound to Evaluate Scapular Movement," on May 7, 2013.

Altered scapular kinematics has been linked to increases in shoulder pain and pathology. Kinematics is the branch of mechanics that deals with pure motion without reference to the masses or forces involved in it and the scapula is the mobile bone to which most of the shoulder muscles are attached. Therefore, normal scapular kinematics or movement is integral to preventing pathology and maintaining a healthy joint and is the focus of Lynn's research.

A custom freehand-ultrasound system was developed at the Human Engineering Research Laboratories that shows high repeatability across trials with a standard error of measurement of < 2° in evaluating scapular movement in static postures with the arm at rest and elevated in the sagittal, frontal and scapular planes. Existing methods to evaluate scapular movement are invasive, expensive, require exposure to radiation, suffer skin based motion artifacts, or allow for examination only in static postures. Freehand three-dimensional ultrasound offers the unique ability to image bone while being non-invasive, relatively low cost, and free of radiation. This is a novel application of a technology that in the past has been used for needle guided injections and determining changes in organ volumes, but never for evaluating bone movement.

Lynn's dissertation provided the initial research findings which recently led to the submission of a VA merit review proposal through the VA Office of Research and Development Rehabilitation Research and Development Service.

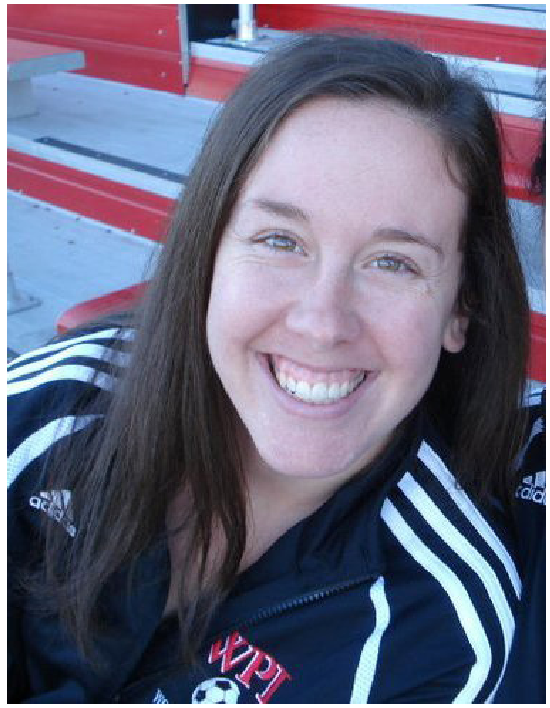
As a junior undergraduate at Worcester Polytechnic Institute (WPI) majoring in biomedical engineering, Lynn was named the 2007-2008 Goldwater Scholar by the Barry M. Goldwater Scholarship and Excellence in Education Foundation. During her years at WPI, she conducted research in biomedical engineering on campus and as part of a National Science Foundation Research Experience for Undergraduates award at the University of Rochester in New York. She worked with Australia's National Science Agency in Melbourne to develop a framework for adapting hands-on science education programs for students with special needs. This undergraduate research experience influenced her decision to consider a career in rehabilitation engineering and associated research and to pursue her PhD in Bioengineering.

The National Science Foundation (NSF) named Lynn an honorable mention in 2009. In 2010, Lynn was awarded an NSF Graduate Fellowship. NSF Graduate Fellowships offer recognition and three years of support for advanced study to approximately 1,000 outstanding graduate students in the mathematical, physical, biological, engineering, and behavioral and social sciences within the United States.

In June of 2013, Lynn started the Physical Therapy program within the School of Health and Rehabilitation Sciences of the University of Pittsburgh. Her internship at the UPMC Center for Assistive Technology over the last 4 years guided her decision to pursue a Doctor of Physical Therapy degree. She also wants to continue working at HERL as a Post-Doctoral Researcher while attending PT school.

While not working or studying, Lynn enjoys baking and specializes in cupcakes. She is also a runner and has completed a few Pittsburgh half marathons. We wish her the best of luck in her future endeavors.

- Andrea Bagay



Honoring Our Veterans
License Plate Now Available in Pennsylvania

Pennsylvania vehicle owners can now show their support of Veterans by purchasing the new "Honoring Our Veterans" license plate. The plate is available for passenger cars and light trucks and costs $35. $15 from the sale of each plate goes to the Veterans Trust Fund administered by the Department of Military and Veterans Affairs. The funds will be used to support and assist Pennsylvania Veterans and their families through grants to Veterans service organizations and other charitable organizations.

The plates are available to everyone, Veteran or not. For more information and to get a copy of the application, visit **http://www.dmv.state.pa.us/license_plates/special_fund.shtml**.

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

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Save the Dates!

Oct. 31 & Nov. 1, 2013

The Disability Experience: State of the Arts in Research, Scholarship, and the Arts

William Pitt Student Union, University of Pittsburgh, Pittsburgh, PA

Panel presentations by students with faculty respondents, drawing from a variety of disciplines.

http://herl.pitt.edu/pittsda/

April 10 & 11, 2014

Third Annual Symposium on Regenerative Rehabilitation

Mission Bay Conference Center, UCSF, San Francisco, CA

Interact with researchers and clinicians in an emerging field that brings the potential of tissue engineering and cellular therapies to patients' benefit.

http://www.mirm.pitt.edu/

ARE YOU INTERESTED IN ASSISTIVE TECHNOLOGY RESEARCH?

The Human Engineering Research Laboratories (HERL) is recruiting individuals interested in participating in research studies for the ASSISTIVE TECHNOLOGY REGISTRY.

If you would like to be notified of research studies related to assistive technology for which you may be eligible to participate, contact The Human Engineering Research Laboratories and join the Assistive Technology 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 assistive technology (e.g. wheelchair, scooter, prosthesis, etc) please contact a Clinical Coordinator at (412) 822-3700 or herlregistry@shrs.pitt.edu.

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Contact us!

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