HERL Newsletter
News from the Human Engineering Research Laboratories Vol. 13, No. 1 · August 2014

Celebrating 20 Years of HERL

Center Grant Funded Through 2019

On June 4, 2014, Human Engineering Research Laboratories directors Dr. Rory Cooper and Dr. Michael Boninger were officially notified by the Department of Veterans Affairs' Rehabilitation Research and Development Service that HERL's Wheelchairs and Associated Rehabilitation Engineering (WARE) grant was renewed for another five-year cycle. This grant renewal ensures HERL's continued existence as a recognized VA Center of Excellence (CoE) through 2019.

In keeping with WARE's grand vision of Unencumbered Mobility, the funding will enable continuing work on devices and adaptations for people in wheelchairs or with other limited mobility or use of limbs. These include (but are not limited to: the Personal Mobility and Manipulation Appliance (PerMMA); StrongArm; the Virtual Seating Coach; the Field Events Throwing Chair; the Single Motor Propelled Wheelchair (SIMPL-WC); Virtual Reality projects; and the Transfer Assessment Instrument (TAI) and other transfer-related projects. New projects based on the grand vision will follow.

Dr. Cooper said he was grateful for VA's continuing support. "The VA Center was the catalyst for the growth of HERL into a world-wide leader in Assistive Technology," said Cooper. "Today, the VA Center is at the core of HERL and remains the grant that defines the values of HERL."

Introducing the Veterans Engineering Resource Center

The VA Pittsburgh Veterans Engineering Resource Center (VERC) utilizes a multidisciplinary approach to improve healthcare processes in the Veterans Health Administration. VERC provides healthcare process improvement coaching, consulting, and training to build strong teams and get proven results. HERL has partnered with VERC for the next five years to identify needs and gaps in wheelchair technologies and to shape the target areas and the designs of our VA-supported pilot studies, and guide the submission of future VA Merit Review applications. **Find out more at http://www.pittsburgh.va.gov/verc/**

For more information on any of the projects listed on this page, please see **http://herl.pitt.edu/research.*

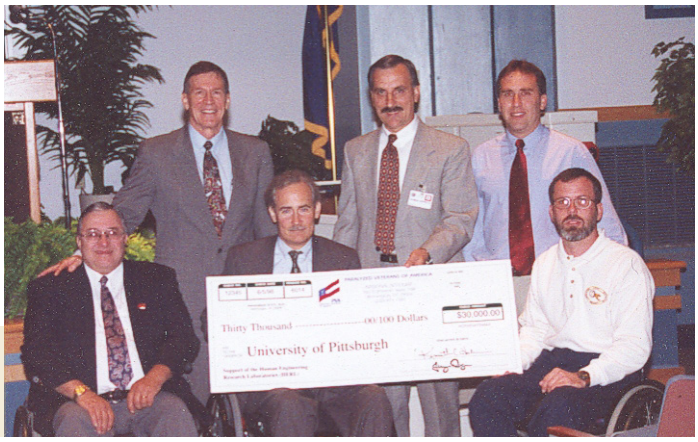
The Human Engineering Research Laboratories this year will mark two full decades of quality research on mobility, assistive technology, and related topics.

In 1994, HERL developed the all-digital SmartWheel, a sensor-enhanced wheel that even 20 years later is still the standard for measuring the mechanisms of repetitive strain to users of wheelchairs. That first success began an unbroken run of research that has not only greatly expanded our knowledge and understanding of mobility issues, but has actively improved the lives of people with disabilities, especially Veterans. HERL researchers have either invented or contributed to the development of products used here and now by people with disabilities. Likewise, just as a new field of propulsion studies became possible with the invention of the SmartWheel, many avenues of research have been built on the foundations of the work that HERL has performed and contributed to over the last 20 years.

HERL's research abilities were greatly enhanced in 1999 with the initial VA Rehabilitation Research and Development Center of Excellence grant. The same year, HERL was also included in funding awarded by the National Institute on Disability and Rehabilitation Research (NIDRR) to establish the University of Pittsburgh Model Center on Spinal Cord Injury.

In 2000, HERL researchers identified the most efficient wheelchair propulsion pattern, which contributed to the 2006 publication of the *Spinal Cord Injury Clinical Guidelines on Preservation of Upper Limb Function*. Between 2001 and 2010, HERL researchers invented a wide variety of appliances for both research and everyday use, including the GameCycle, the oblique angle caster fork, PathLock, a low-cost pediatric wheelchair, PerMMA, the Virtual Seating Coach, and the Cueing Kitchen.

More recently, in 2011 HERL again added to its world-class research standing with a move into a dedicated facility at Pittsburgh's Bakery Square offices. This move more than doubled the research area available for use and allowed more research studies to take place simultaneously, which has led to the inventions of StrongArm, MeBot, and Kitchenbot since then.



Right: Drs. Cooper and Boninger receive funding from PVA, 1994.

Current Research Abstracts

Groah SL, Ljungberg I, Lichy A, Oyster M, Boninger ML, "Disparities in Wheelchair Procurement by Payer Among People with Spinal Cord Injury," *Physical Medicine and Rehabilitation*, pp. 412-417, Vol. 6, No. 5, May 2014.

SUMMARY: This study shows a measurable disparity in wheelchair procurement according to insurance provider.

Objective: To identify insurance provider-related disparities in the receipt of lightweight, customizable manual wheelchairs or power wheelchairs with programmable controls among community-dwelling people with spinal cord injury (SCI).
Setting: Six Spinal Cord Injury Model System centers.
Design: A multicenter cross-sectional study.
Participants: A total of 359 individuals at least 16 years of age or older and 1 year after SCI who use a manual or power wheelchair as their primary means of mobility. The subjects were stratified by payer, and payers were grouped according to reimbursement characteristics as follows: Medicaid/Department of Vocational Rehabilitation (DVR), private/prepaid, Medicare, Worker's Compensation (WC)/ Veterans Affairs (VA), and self pay.
Methods: Demographic, wheelchair, and payer data were collected by medical record review and face-to-face interview.
Results: There were 125 participants in the Medicaid/ DVR group, 120 in the private/prepaid group, 55 in the Medicare group, 30 in the WC/VA group, and 29 in the self-pay group. For manual wheelchair users, the likelihood of having a lightweight, customizable wheelchair was 97.5% for private/prepaid, 96.3% for Medicaid/DVR, 94.1% for WC/VA, 87.5% for Medicare, and 82.6% for self pay. For power wheelchair users, those with WC/VA (100%) were most likely to receive a customizable power wheelchair with programmable controls, followed by private/prepaid (95.1%), Medicaid/DVR (86.0 %), Medicare (83.9%), and self pay (50.0%).
Conclusions: The only payer group for which all beneficiaries received wheelchairs that met standard of care were power wheelchairs provided by WC/VA. Fewer than 90% of people whose manual wheelchair was paid for by Medicare and self pay, and whose power wheelchair was paid for by Medicaid/DVR, Medicare, and self pay did not meet standard of care. Although these findings need to be correlated with long-term risks, such as overuse injuries, breakdowns, and participation, this study demonstrates that disparities in wheelchair procurement by insurance provider persist.

Huang W, Vodovotz Y, Kusturiss MB, Barclay D, Greenwald K, Boninger ML, Coen PM, Brienza D, Sowa G, "Identification of Distinct Monocyte Phenotypes and Correlation with Circulating Cytokine Profiles in Acute Response to Spinal Cord Injury: A Pilot Study," *Physical Medicine and Rehabilitation*, pp. 332-341, Vol. 6, No. 4, 2014.

SUMMARY: Immune response differs in subgroups of individuals with traumatic spinal cord injury based on microphage phenotype.

Background: Macrophage infiltration to the injury site during the acute response to traumatic spinal cord injury (SCI) is not uniform. Macrophage phenotype has been characterized as either proinflammatory (M1) or anti-inflammatory (M2). Results of animal studies suggest that M1 or M2 dominance at the site of injury relates to spontaneous recovery after SCI.
Objective: To investigate whether the phenotype of circulating macrophage precursors-monocytes (MO) is altered in the acute phase of SCI and corresponds to circulating inflammatory cytokines.
Study Design: A prospective observational cohort study.
Setting: A single academic medical center in Pennsylvania.
Patients: A cohort of 27 subjects with complete or incomplete traumatic SCI enrolled within 7 days after SCI injury.
Methods: The MO phenotype was defined within the first week after SCI by using flow cytometry and was compared with that of historic uninjured controls. Concentrations of 25 cytokines and/or chemokines were assessed by using Luminex in serial blood samples up to 2 weeks after SCI. An analysis of variance was used to determine the correlations between the phenotypes and the cytokine profiles.
Results: Patient subsets were identified with either M1- or M2-dominant circulating MOs distinct from the uninjured controls. The M1 dominant was associated with higher circulating levels of proinflammatory mediators interleukin (IL)12p70 and interferon gamma-induced protein 10 kDa (IP-10/CXCL10), and lower levels of anti-inflammatory cytokines IL-10, IL-15, and IL-7, whereas the M2 dominant exhibited the opposite cytokine profiles with significantly higher IL-10 and IL-7.
Conclusion: In the acute phase after SCI, at comparable injury severity, subgroups of patients exhibit distinct M1 or M2 MOs dominance and the phenotype is correlated with M1- or M2-specific cytokine and/or chemokine profiles. Although further studies are needed to determine how these observed phenotypic differences relate to functional recovery, our findings (1) provide the first evidence, to our knowledge, that indicates the possible individual differences in the immune responses to the comparable traumatic SCI, with potential implications for management of acute SCI and rehabilitation; and (2) may represent easily accessible biomarkers with prognostic utility.

Current Research Abstracts

Mason B, Lenton J, Rhodes J, Cooper RA, Goosey-Tolfrey VL, "Comparing the activity profiles of wheelchair rugby using a miniaturised data logger and radio frequency tracking system," *BioMed Research International*, 8 pages, Article ID 348048, 2014.

SUMMARY: Miniaturized dataloggers are acceptable for monitoring the distance covered and mean speed during wheelchair rugby, but not for reporting peak speeds.

The current study assessed the validity and reliability of a miniaturised data logger (MDL) against a radio-frequency-based indoor tracking system (ITS) for quantifying key aspects of mobility performance during wheelchair rugby. Eleven international wheelchair rugby players were monitored by both devices during four wheelchair rugby matches. MDL data were averaged over both 1-second (MDL-1) and 5-second (MDL-5) intervals to calculate distance, mean, and peak speeds. The results revealed no significant differences between devices for the distance covered or mean speeds, although random errors of 10% and 12%, respectively, were identified in relation to the mean values. No significant differences in peak speed were revealed between ITS ($m \cdot s^{-1}$) and MDL-1 ($m \cdot s^{-1}$). Whereas peak speeds in MDL-5 ($m \cdot s^{-1}$) were significantly lower than ITS. Errors in peak speed led to large random errors in time and distance spent in speed zones relative to peak speed, especially in MDL-5. The current study revealed that MDL provide a reasonable representation of the distance and mean speed reported during wheelchair rugby. However, inaccuracy in the detection of peak speeds limits its use for monitoring performance and prescribing wheelchair rugby training programmes.

New VA Grants

Dr. Dan Ding:
VA RR&D Merit Review entitled Field-Based Assessment of Energy Expenditure in Spinal Cord Injury

Dr. Rory Cooper:
VA RR&D Merit Review entitled Assessment of an Experimental Robotic Assisted Transfer Device

Dr. Jen Collinger:
VA RR&D Merit Review entitled Covert Sensorimotor Mapping for Guiding Brain-Computer Interfaces

Dr. Alicia Koontz:
VA RR&D SPiRE entitled Feasibility of Microsoft Kinect for Assessment of Independent Wheelchair Transfers

Patent News: Glide, Seating Coach Now on Market

Two inventions emerging from HERL research have recently been brought to market. The **Glide Suspension Fork** (U.S. Patent #6,892,421) is being offered by Out-Front for TiLite manual wheelchairs. The Glide Fork acts as a horizontal and vertical vibration dampener/absorber for caster wheels.

The **Virtual Seating Coach** (patent pending) will shortly be offered as an option on new Permobil power wheelchairs. The Virtal Seating Coach monitors wheelchair power seating functions and ties into a smartphone app, which sends reminders to the user to perform clinician-directed seating changes.

HERL staff in 1994.

The "Wheelchair Repairs" Controversy ... and Why It Matters

SUMMARY: Further research is required to investigate a reported difference in the number of repairs required by power wheelchairs made by different manufacturers.

In the April 2014 issue of *Archives of Physical Medicine and Rehabilitation*, HERL researcher Dr. Lynn Worobey and other HERL researchers published a paper entitled "Differences Between Manufacturers in Reported Power Wheelchair Repairs and Adverse Consequences Among People With Spinal Cord Injury." The paper concluded that further research was required to investigate a reported difference in the number of repairs required by power wheelchairs made by different manufacturers. In other words, some manufacturers' wheelchairs appeared to require a greater number of repairs over time. The authors conclude the report by suggesting that "[o]ne possible way to improve wheelchair quality would be to require external standards testing and uniform reporting of failures."

The journal invited a response from Dr. Lisa Iezzoni of the Massachusetts General Hospital and Dr. Michael Ogg, former physics professor at Carleton University. The response, which was published in the same issue, was entitled "Performance Metrics for Power Wheelchairs: A Pipe Dream?" They argue in this article that power wheelchair setup and environmental factors are so individualized that sorting wheelchair failure by manufacturer is invalid. Moreover, they question the value of producing a "*Consumer Reports*"-style list of power wheelchairs due to the difficulty of creating useful performance metrics for such rapidly-changing technology.

This prompted, again in the same issue of the journal, a "rebuttal to the rebuttal" from Dr. Michael Boninger, HERL Medical Director, and Dr. Worobey. Entitled "Perfect—the Enemy of Good," the authors argue that, far from being useless, performance metrics on rapidly-changing technologies are used by thousands of people every day - for cars! Moreover, reviews for just about everything can be found online, so why not wheelchairs? The authors sum up with a further call for more work to be performed on the topic, since power wheelchairs need repairs far too often. "[O]ur conclusion is that we need ... more information, larger cohorts, and better methods."

This debate is a great example of the scientific process in action. A rebuttal to a premise is superior to blandly accepting the premise. The final conclusion, which is that further study is needed before any action can be taken, is confirmed and presumably agreed on by all parties.

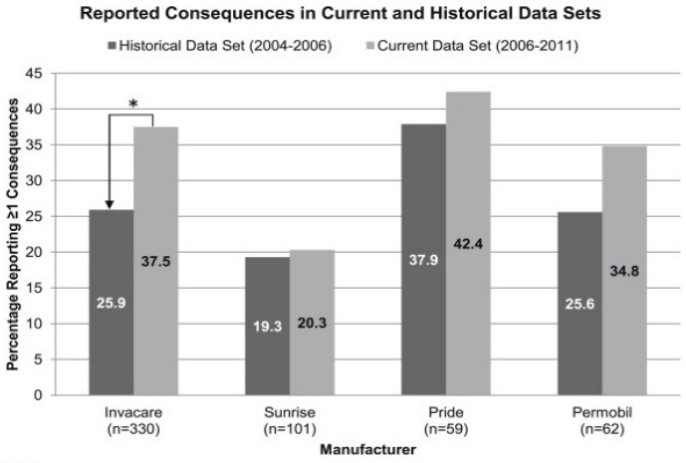


Fig 4.
Increases in reported number of consequences between data sets (asterisk and arrow indicate significant increase).

Citations:

Worobey L, Pearlman J, Oyster M, Gebrosky B, Boninger ML, "Differences between Manufacturers in Reported Power Wheelchair Repairs and Adverse Consequences among People with Spinal Cord Injury," *Archives of Physical Medicine & Rehabilitation*, pp. 597-603, Vol. 95, No. 4, April 2014.

Iezzoni LI, Ogg M, "Performance Metrics for Power Wheelchairs: A Pipe Dream?" *Archives of Physical Medicine and Rehabilitation*, pp. 604-607, Vol. 95, No. 4, April 2014.

Boninger ML, Worobey L, "Perfect - the Enemy of Good," *Archives of Physical Medicine and Rehabilitation*, pp. 608-609, Vol. 95, No. 4, April 2014.

HERL's 1994 Grand Opening ceremony at the Highland Drive VA Pittsburgh campus.

SUMMARY: State of the Science Symposium on Regenerative Medicine

The State of the Science Symposium on Regenerative Medicine for Wounded, Injured, and Ill Veterans was held in Sanford Auditorium at the Uniformed Services University of the Health Sciences in Bethesda, Maryland on June 6, 2014. Over 100 Service Members and civilians registered to attend, and lunch was served courtesy of funding from the Paralyzed Veterans of America.

The first speaker, **Bryan J. Pfister, PhD** of the New Jersey Institute of Technology's Center for Injury Biomechanics, Materials and Medicine gave a presentation on Neural Tissue Engineering that discussed current nerve repair techniques and possibilities for future nerve repair.

Next, **Changfeng Tai, PhD** from the University of Pittsburgh's Departments of Urology, Bioengineering, Pharmacology, and Chemical Biology presented "A Novel Neuroprosthesis to Restore Bladder Function after SCI" concerning high-frequency electrical nerve stimulation as an aid to urination.

Roy D. Bloebaum, PhD, director of the Bone & Joint Research Laboratory at the George E. Whalen VA Medical Center in Salt Lake City, Utah, presented an overview of osseointegrated implants.

A talk entitled "Regenerative Rehabilitation Approaches to Improve Skeletal Muscle Healing and Functional Recovery" was presented by **Fabrisia Ambrosio, PhD, MPT** of the McGowan Institute for Regenerative Medicine at the University of Pittsburgh.

Thomas J. Walters, PhD, a Research Physiologist with the US Army Institute of Surgical Research at Ft. Sam Houston, TX, presented "Rehabilitation and Regenerative Medicine for Combat Related Extremity Trauma" on current strategies for muscle and tissue reconstruction.

The next speaker was **Octavia "Tae" Harris**, retired US Navy Command Master Chief and current Program Manager of the Comprehensive Advanced Restorative Effort (CARE) Program at the Naval Medical Center in San Diego. She discussed the CARE Program, which is designed to facilitate optimal appearance and functional recovery following trauma.

Next, **Ron Poropatich, MD**, the Executive Director of the Center for Military Medicine at the University of Pittsburgh presented an overview of current research being conducted by the Center.

The final speaker was **LTC Leon J. Nesti, MD PhD**, Walter Reed National Military Medical Center Chief of Clinical and Experimental Orthopaedics, who discussed the present and future state of peripheral nerve regeneration.

Videos, presentations, and photos from this symposium are available, along with biographies of all speakers, on the HERL website at **http://herl.pitt.edu/regen-med**. You can also browse symposia dating back to 2011 at **http://herl.pitt.edu/education-outreach/symposia**.

The next symposium on Advanced Technology for Veterans will be September 12, 2014.

HERL staff, 10th Anniversary, 2004.

HERL staff, 2011.

HERL students won numerous awards at this year's Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference, held June 11-15, 2014, in Indianapolis, Indiana. Here are two articles by two winners of this year's Best Student Scientific Papers about their award-winning research.

Ima Udofa: *3D Freehand Ultrasound to Measure Scapular Kinematics*

The Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) selected the paper submission "Three-Dimensional Freehand Ultrasound to Measure Scapular Kinematics and Relationship to Shoulder Pain in Manual Wheelchair Users" of HERL researchers Ima Udofa; Lynn Worobey, PhD; Yen-Sheng Lin, PhD; and Michael Boninger, MD as one of the five winning papers for the 2014 RESNA Student Scientific Paper competition.

The overall goal of the study was to use three-dimensional freehand ultrasound (3D FUS) to measure scapular kinematics and determine their relationship with subject characteristics. The prevalence of shoulder pain among wheelchair users is 31-73%, which is higher than the general population. Shoulder pain and pathology are generally not the result of isolated episodes and have been linked to changes in scapular movement. Existing methods to evaluate scapular movement (i.e. xrays, MRIs, bone pins, etc.) include the following limitations: invasive, expensive, require exposure to radiation, skin-based motion artifacts. Consequently, this study uses 3D FUS to measure scapular kinematics as it has the potential to overcome the aforementioned limitations. 3D FUS combines ultrasound and motion tracking and enables 3D reconstruction of scapular position.

A total of 44 subjects participated in this study: 22 manual wheelchair users (MWUs) and 22 able-bodied controls, who were gender and age matched within ±5 years. Subjects were asked to complete basic intake forms and pain questionnaires. Each subject also underwent physical and ultrasound exams of the upper extremity (PESS and USPRS, respectively) to investigate shoulder pathology. Participants were imaged multiple times in each of the four positions of interest: arm by the participant's side at rest and arm raised to 90° in the sagittal, frontal, and scapular planes.

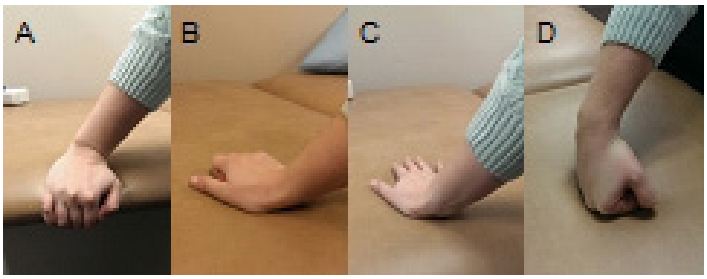
Correlations were found between scapular kinematics and body mass index (BMI), shoulder pathology from the PESS and USPRS, and years of wheelchair use. For scapular rotations at rest, individuals with higher BMI displayed decreased posterior tilting. Individuals with greater trunk flexion had greater upward rotation and less posterior tilting at rest. Decreased posterior tilting of the scapula and increased kyphosis (trunk flexion) are related to shoulder pain and result in a slouched posture that can increase the risk for impingement. It was also found that scapular position when the arm was elevated was predicted by scapular position at rest. This indicates that someone's resting posture has a significant effect on how the scapula moves and that a more 'impinged' position during scapular elevation was predicted by a more 'impinged' position at rest. The results of this study also revealed that USPRS score was significantly correlated to the difference in posterior tilting between elevated and rest positions for the sagittal and scapular planes. This correlation suggests that increased pathology is related to less posterior tilting with humeral elevation. BMI was significantly correlated to decreased posterior tilting in all testing positions. This relation suggests that an increase in weight adversely affects scapular tilting. Among MWUs, those using a wheelchair for more than 10 years demonstrated greater internal rotation of the scapula in all testing positions. The increase in internal rotation can be harmful as it may put the head of the humerus closer to the anterior aspect of the acromion and increase the likelihood of impingement.

Future studies using these results may be used towards a better understanding of scapular kinematic patterns for wheelchair users and people with shoulder injuries or pathologies. Understanding scapular kinematics and its relationship to subject characteristics could prove to be essential to improving preventative care for shoulder injuries among MWUs.

Nathan Hogaboom: *Ultrasonic Changes of the Median Nerve*

Wheelchair users with Spinal Cord Injuries are at risk of developing overuse injuries in the arms. They are particularly susceptible to carpal tunnel syndrome (CTS), more so than those who do not use wheelchairs. This disorder causes pain, numbness, and weakness in the wrist and hands, and is caused by compression of the median nerve in the wrist. CTS is what is called an "overuse disorder", as it is commonly associated with activities that involve a lot of hand and wrist use. In those who use wheelchairs, it is often the result of having to propel and transfer to and from their wheelchairs repeatedly throughout the day. This is the topic of "Ultrasonographic Changes of the Median Nerve Indicative of Carpal Tunnel Syndrome are Related to Hand Placement During Transfers" by Nathan Hogaboom, Michelle Oyster, Dr. Alicia Koontz, and Dr. Michael Boninger.

Transfers allow someone to move from their wheelchair to a seat in a car, at the dinner table, or the movie theater. Anything that impedes an individual's transfer ability, including CTS, will negatively impact their independence and quality of life. Researchers at HERL wanted to look at how transfers affect the median nerve in the wrist. We hoped to identify transfer skills that could reduce the risk of developing CTS. So we asked wheelchair users with SCI to transfer back and forth onto a mat table at different heights. Before and after they performed 18 transfers in a row, we took ultrasound images of the median nerve at the inlet of the carpal tunnel in the wrist. We also graded their transfer quality and whether their natural transfer involved performing certain skills using a tool developed at HERL, the Transfer Assessment Instrument. Results of the study showed that the median nerve increased in size immediately after transfers. A larger nerve at the inlet of the carpal tunnel is one ultrasound marker of CTS. These results indicate that transfers may expose the carpal tunnel to compression that causes acute swelling of the nerve. Further, participants who properly utilized handgrips (shown above) during the transfer experienced fewer changes. In this study, placing the hand in one of these positions during transfers promoted a more wrist-protective transfer.



Proper (A, B) and improper (C, D) use of handgrips.

Although it is not explicitly known what a lifetime of transfers will do, results from the present study indicate that hand placement during transfers can affect the median nerve. Wheelchair users may be able to avoid development of CTS by placing their hands in safe postures when transferring. They can also consult "Preservation of Upper Limb Function Following Spinal Cord Injury: What You Should Know" for more information about how to prevent injuries from transfers and other activities. The guide can be downloaded for free at http://is.gd/EgnRon.

Meet a HERL Researcher: Dr. Jennifer Collinger

Jennifer Collinger, PhD, is an assistant professor in the Department of Physical Medicine and Rehabilitation at the University of Pittsburgh and a Research Biomedical Engineer for the VA RR&D WaRE Center of Excellence. Dr. Collinger received her PhD in Bioengineering from the University of Pittsburgh in April 2009after serving as a graduate research associate at HERL.

Dr. Collinger's early work was focused on Acute Biceps and Supraspinatus Tendon Changes Associated with Wheelchair Propulsion. She has since shifted her focus to brain computer interfaces, work which has garnered her national attention. A person with tetraplegia was able to use a brain-computer interface to control a prosthetic limb using only her thoughts. This work was conducted in the University of Pittsburgh Human Rehabilitation and Neural Engineering Laboratory in collaboration with the Johns Hopskins University Applied Physics laboratory and was funded by the Defense Advanced Research Projects Agency. This research won the Clinical Research Forum Top 10 Clinical Research Achievement Award in 2013, and was highlighted in a 60 Minutes piece in December 2012 which demonstrated how an individual with a sensor implanted in her brain could control a robotic arm with her thoughts. This research was also published in the *Lancet*, the world's leading independent general medical journal, in February 2013 and was named one of the Top 10 Science Breakthroughs of the Year by *Science* Magazine.

In Dr. Collinger's four years as a VA Research Biomedical Engineer, she has been instrumental in securing VA funding to conduct this and other cutting-edge research. Dr. Collinger has received a VA Veterans Integrative Service Network Competitive Pilot Project Fund award, an RR&D Career Development Award, an RR&D Merit Review award, and has played a significant role in obtaining VA funding in collaboration with other HERL researchers.

Dr. Collinger's work on VA RR&D Merit Review entitled Enhancement of Motor Cortex Activity in Persons with Spinal Cord Injury has been ongoing since January 2011. The study involves noninvasive research and utilizes magnetoencephalography (MEG) which is a technique for mapping brain activity. This study is based on the mirror neuron system, which is a group of cells in the brain that are active not only when a person performs an action, but also when they observe an action performed by someone. The study paired a participant's movement related brain signals with a video display of a hand grasping so that by seeing the video of hand grasping it is expected that the participant could control the movement. By linking the participant's MEG signals to a virtual hand, the mirror neuron system is activated which maps the observed action onto the subject's own motor representation. This concept is called neurofeedback where a person learns to control their brain activity through real-time feedback. The study is important in helping to facilitate motor cortex activation in Veterans with tetraplegia.

Continuing with the noninvasive methodology of this work, Dr. Collinger's most recent VA RR&D Merit Review award entitled Covert Sensorimotor Mapping for Guiding Brain-Computer Interfaces, will use enriched covert techniques (imagery) to map the motor and sensory areas of the brain in able-bodied subjects and people with tetraplegia. Covert techniques will be utilized since mapping brain activity cannot be used for people with motor and sensory impairments such as those that result from a spinal cord injury. Covert brain mapping also enables the study of cortical changes that occur after an injury or rehabilitation intervention.

One of Dr. Collinger's most notable achievements was being named one of Popular Mechanics 10 World-Changing Innovators of 2012 for the ECoG Brain-Computer Interface Research (Co-Innovators: Michael Boninger, Alan Degenhart, Andrew Schwartz, Elizabeth Tyler-Kabara, Wei Wang, Tim Hemmes). She received an Honorable Mention, Association of Academic Physiatrist Excellence in Research Writing Awards Competition for "Validation of Grayscale-Based Quantitative Ultrasound in Manual Wheelchair Users: Relationship to Established Clinical Measures of Shoulder Pathology," awarded April 2011.

In her free time, Dr. Collinger enjoys sports and the outdoors . She is the mother of a little boy, Nathan.

- Andrea Bagay

Paralyzed Veterans of America

New PVA Logo Debuts

Say "so long" to Speedy. The Paralyzed Veterans of America (PVA) has introduced a new logo. This logo replaces the old logo, which dated back to 1958.

The new logo, which emphasizes the membership's service to the country, will be used by all 34 chapters of the PVA.

We like it. It's up to date and a great logo for the 21st century. Frankly, we think that it looks a little bit familiar - all of us probably have acquaintances, colleagues, or loved ones that might just look a bit like the Veteran in the new logo.

Human Engineering Research Laboratories

VA Center of Excellence for Wheelchairs and Associated Rehabilitation Engineering

University of Pittsburgh
School of Health & Rehabilitation Sciences
School of Medicine

University of Pittsburgh
NIDRR Model Center on Spinal Cord Injury

National Science Foundation
Advanced Technology Education Center

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HERL Research Report & 20th Anniversary Brochure

Have you received a copy of the HERL Research Report? Includes information on HERL's current projects, initiatives, and facilities. Full color with many photos. 12 pages. Printed with HERL's 20th Anniversary Commemorative Brochure (4 pages; full color).
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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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