New Beginning for First HERL Staff Member

Spring 2010 marked the departure of HERL’s first staff member. After almost 16 years, our Administrative Officer Paula Stankovic accepted a new position with the VA Pittsburgh Healthcare System as a contract specialist. Paula worked at HERL from its’ beginning, starting as our director Dr. Rory Cooper’s assistant when he moved from California to Pittsburgh in 1994. Back then, the lab consisted of only 2 graduate students and Paula who oversaw all clerical, clinical, and administrative duties. As we expanded over the years, Paula became our Research Coordinator and later our Administrative Officer (AO). Throughout her career at HERL, she has probably performed almost every duty currently covered by about 9 research support staff, including subject testing, grant submissions, website maintenance, technology transfer and invention disclosure submissions, and the coordination of the summer internship program. Paula was also the first to organize many activities that have developed into formal programs, such as the Walter Reed State of the Science Lecture Series and the TechLink robotics camps. As AO, Paula oversaw budgets for all grant submissions, ensured HERL’s compliance with VA and University of Pittsburgh rules and regulations, supervised the HERL research support staff, and administered employee payrolls and records for all faculty, staff and students.

Because of her experience and willingness to share, the HERL staff considered her “the person with the answers.” In December, Paula completed her Associates degree in business management with honors. She is planning to return to school in the fall to complete her bachelors.

I’m sure our many research participants, colleagues and supporters who have had the opportunity to work with Paula join us in appreciation of her dedication to our continued success and wish her the best in her career.

-Christine Heiner
CURRENT RESEARCH ABSTRACTS

Does Upper Limb Muscular Demand Differ Between Preferred and Non-Preferred Sitting Pivot Transfer Directions in Individuals With Spinal Cord Injury?
Dany Gagnon, PT, PhD; Alicia M. Koontz, PhD, RET; Eric Brindle, BSE Student; Michael L. Boninger MD; Rory A. Cooper PhD


Purpose of the work: The main objective of this study was to determine if upper limb muscular effort was reduced when performing a sitting pivot transfer in the preferred direction in comparison to doing so toward the non-preferred direction among individuals with a spinal cord injury (SCI).

Subjects/Procedures: Fourteen individuals (on average: 47.0 years; 1.80 m, and 75.3 kg ) with SCI levels ranging from C6 to S1 participated in this study during the 2008 National Disabled Veterans Winter Sports Clinic. Surface electromyography (EMG) was used to record activity of key upper limb muscles during sitting pivot transfers. These transfers were performed in each the preferred and non-preferred directions from their wheelchair to a padded tub bench of even height.

Results: Similar peak muscular efforts were found between the preferred and non-preferred transfer directions for all muscles. The peak muscular effort were also found to be similar between the leading and trailing upper limbs during the transfers in all muscles, except for one (anterior deltoid) found to be solicited the most at the trailing upper limb. Comparable overall muscular work was calculated between the preferred and non-preferred transfer directions for all muscles and between the leading and trailing upper limbs.

Relevance to manual wheelchair users with SCI: These results indicate that direction preference expressed by individuals with a SCI when transferring is not explained by relative muscular effort difference.

-Dany Gagnon, PhD

Reliability of Quantitative Ultrasound Measures of the Biceps and Supraspinatus Tendons
Jennifer L. Collinger, PhD; Dany Gagnon, PhD, PT; Jon Jacobson, MD; Bradley G. Impink, BS; Michael L. Boninger, MD


Purpose of the work: Ultrasound has been widely used clinically to examine soft tissue structures, including tendons. However, in order to use ultrasound in a research setting, it’s reliability must be quantified. Ultrasound will allow us to evaluate acute changes of shoulder rotator cuff tendons in response to activity, such as wheelchair propulsion.

Subjects/Procedures: Two examiners captured ultrasound images of the non-dominant long head of the biceps tendon and supraspinatus tendon from twenty volunteers, including 5 manual wheelchair users. Each examiner captured two images per subject under two different preparations which includes subject positioning and reference marker placement. Image processing, or reading, was performed twice to compute 9 quantitative ultrasound measures of grey-scale tendon appearance using first-order statistics and texture analysis. Generalizability theory was applied to compute inter- and intra-rater reliability using the coefficient of dependability, Φ, for multiple study design protocols.

Results: Inter-rater reliability was generally low, and we recommend that a single evaluator capture all images for quantitative ultrasound protocols. Most (n = 14 of 18) of the quantitative ultrasound measures exhibited at least moderate (Φ>0.50) reliability for a single image, captured under one preparation, and read once. However, by following a protocol designed to minimize measurement error, one can increase the reliability of quantitative ultrasound measures.

Relevance to Wheelchair Users: We believe that an appropriately designed protocol will allow quantitative ultrasound to illustrate acute tendon changes and lead to the development of interventions to reduce risk factors for musculoskeletal injury.

-Jen Collinger, PhD
CURRENT RESEARCH ABSTRACTS

Biomechanical Analysis of Functional Electrical Stimulation on Trunk Musculature During Wheelchair Propulsion
Yu-Sheng Yang, PhD, Alicia M, Koontz PhD, RET, Ronald J, Triolo PhD, Rory A. Cooper, PhD, and Michael L. Boninger MD

Purpose of the work: The objective of this study was to examine how surface functional electrical stimulation (FES) of trunk muscles influences propulsion technique and shoulder muscle activity in a group of individuals with spinal cord injury.

Subjects/Procedures: Eleven manual wheelchair users (MWUs) with paraplegia enrolled in this study. Two surface electrical stimulators were used to artificially contract paralyzed abdominal and back muscles. Propulsion forces and moments, trunk motion, energy expenditure, and surface electromyographic (sEMG) activity of six shoulder muscles were collected synchronously during a series of propulsion trials. Two different stimulation levels (LOW and HIGH) were compared to a control condition (no stimulation).

Results: The results showed that participants with HIGH stimulation produced higher propulsion power output (p=0.02) and increased their gross mechanical efficiency (GME) (p=0.05) during wheelchair propulsion. No differences were found in shoulder sEMG activity, energy expenditure, and trunk motion between stimulation levels.

Relevance to Wheelchair Users: Our findings indicate that FES applied to the trunk musculature has a potential advantage in helping MWUs with SCI improve propulsion efficiency without placing additional demands on the shoulder muscles.

-Yusheng Yang, PhD

Upper Limb Nerve Entrapment Syndromes in Veterans with Lower Limb Amputations.
Jay Pyo, DO, Paul F. Pasquina, MD, Michael DeMarco, DO, Robert Wallach, DO, Emily Teodorski, BS, Rory A. Cooper, PhD

Purpose of the Work: The purpose of this pilot study was to examine the prevalence and severity of upper limb entrapment syndromes in a sample of veterans with lower limb amputations.

Subjects/Procedures: Twenty subjects were recruited at the 2008 National Disabled Veterans Winter Sports Clinic. All study subjects completed a questionnaire which included symptomatology of both upper limbs, past medical history, time since amputation, medication history, use of assistive technology, and wheelchair characteristics. A physical exam and electrodiagnostic test was then performed on each subject. The physical exam included an assessment of bilateral upper limb weakness or sensory abnormalities, thenar/hypothenar atrophy, deep tendon reflexes, Tinel’s test of the wrist and elbow, and Phalen’s maneuver.

Results: Twenty subjects (19 male and 1 female) were enrolled in the study, with a total of 38 upper limbs evaluated. The mean age of the subject population was 59±13 years, with an average of 23 years since the time of their amputation. A total of 16/20 (80%) subjects had electrodiagnostic findings consistent with median neuropathy across the wrist (26/38 affected limbs, 6 subjects with unilateral and 10 subjects with bilateral findings), and 14/20 (70%) subjects had ulnar entrapment neuropathy across the elbow (22/38 affected limbs, 6 subjects with unilateral and 8 subjects with bilateral findings). Several subjects (6/20, 30%) were found to have electrodiagnostic evidence of ulnar entrapment neuropathy across the wrist (10/38 affected limbs, 2 unilateral and 4 bilateral findings).

Relevance to People with Amputations: Although this was a pilot study, we identified a high number of veterans with lower limb amputations who presented with upper limb nerve entrapment syndromes.

-Jay Pyo, DO
Former HERL Graduate Student Joins Technical Staff

Corey Blauch completed his masters of science in Rehabilitation Science and Technology while working at HERL in 2002. Corey’s thesis project was designing the forward folding collapsible ultralight wheelchair, which is currently in the process of being patented. This unique wheelchair disassembles and folds to fit into an airplane’s overhead bin and features "airplane wheels," which allows the chair to act as an aisle chair for mobility inside an aircraft.

Corey left HERL to work as a design engineer for Pride Mobility, a wheelchair manufacturer in Exeter, PA. Later Corey worked as senior human factors engineer at Gentex Corporation, where he developed the next generation aircrew helmet for the military.

This spring Corey returned to HERL to become the sixth member of our technical staff who support our machine shop and electronics lab that house the resources for the development and testing of designs, fabrications and prototypes for our research projects.

VAPHs Hosts Air Rifle Clinic for Veterans with Disabilities

In preparation for the 2011 Pittsburgh National Veterans Wheelchair Games, the VA Pittsburgh Healthcare System held a free instructional air rifle clinic on March 26 and a sectional championship on March 27 for Veterans with physical disabilities. The event was part of the 2010 National Rifle Association National Disabled Indoor Sectional Championship and was co-hosted by the HOPE Network and the Keystone Paralyzed Veterans of America.

The 2011 National Veterans Wheelchair Games are scheduled for August 1-6, 2011. Veteran athletes will compete in 17 sports such as quad rugby and archery, power soccer and weight-lifting in an exciting combination of competition, camaraderie and courage.

IMPORTANT ANNOUNCEMENT
FOR HERL NEWSLETTER E-MAIL SUBSCRIBERS

Please be aware that we are using different e-mail subscription software to deliver the newsletter to you.
To make sure that you don’t miss any future issues, please make sure to configure your e-mail to allow messages from the address herlnewsletter@list.pitt.edu to be delivered.
You can view general information about the list and subscribe or unsubscribe from the list at https://list.pitt.edu/mailman/listinfo/herlnewsletter.

The old newsletter announcement list was de-activated.

Thanks for your cooperation!
**Awards and Accomplishments**

**Nahom Beyene** was awarded a National Society of Black Engineers (NSBE) Alumni Extension Technical Scholarship. Recipients of this award have shown great achievement in the academic arena and dedicated service to NSBE and their local campus community. Nahom received a $2,000 scholarship and recognition at the 2010 NSBE Golden Torch Awards ceremony in Toronto.

**Amit Kumar** was awarded 1st and 3rd place in the 2010 University of Pittsburgh School of Health and Rehab Sciences poster contest for his work in graduate research class projects: “Forward Facing Wheelchair Securement System” and “Assessing the Test- Retest Reliability of Functional Mobility Assessment.”

HERL Director **Rory Cooper, PhD** received the Greater Pittsburgh Council of the Boy Scouts of America 2010 Community Cornerstone Award for his selfless volunteer community leadership. The VA Pittsburgh Healthcare System also recognized Dr. Cooper during VA Research Week in April for his outstanding commitment to excellence in research to improve Veterans lives.

**Shivayogi Hiremath** and **Kevin Toosi** were among the winners of the 2010 Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Student Scientific Paper competition. Shiv’s paper is entitled “Evaluation of Activity Monitors in Estimating Energy Expenditure in Manual Wheelchair Users.” Kevin Toosi’s award winning paper, “Investigation of Median Nerve Entrapments in Veterans with Major Limb Amputations,” was from a collaborative research project with Physical Medicine & Rehabilitation residents and staff from Walter Reed Army Medical Center. The winners will receive a $1,000 honorarium and a free registration to the RESNA 2010 conference, June 28 – 29 in Las Vegas, NV. The winners will also present their work in a Platform Session at the conference.

**Lynn Worobey** was awarded a National Science Foundation Graduate Research Fellowship. The fellowship program recognizes and supports outstanding graduate students in NSF-supported science, technology, engineering, and mathematics disciplines who are pursuing research-based master's and doctoral degrees in the U.S. and abroad.

HERL staff, students and faculty raced in the Pittsburgh marathon and half marathon on May 2. **Attila Domos**, an accomplished athlete who has participated in countless HERL research studies, and **Dr. Rory Cooper** competed in the 26.2 mile wheelchair handcrank division. Attila took 1st place, completing the race in 1 hr and 33 minutes. Dr. Cooper took third in 1 hr and 46 minutes. **Mary Goldberg, Michelle Sporner, Shiv Hiremath, Amit Kumar, Jon Pearlman, and Harshal Mahajan** also ran the 13 mile half marathon. Mary and Michelle supported each other to complete the course in 1 hr and 59 minutes. The HERL racers raised money for the Veterans Leadership Program of Western PA.
Meet the Education and Outreach Staff

Mary Goldberg, M.Ed., and Shelly Brown, M.Ed., are HERL’s Education and Outreach Coordinators. Through collaboration with the University of Pittsburgh’s Department of Rehabilitation Science and Technology, both ladies work diligently enriching student awareness and promoting academic programs from Kindergarten through the graduate level that focus on transforming the lives of people with disabilities.

Shelly Brown pursued her Master’s degree in Education after 12 years of service as a Pittsburgh Police Officer. She is an active member of the Pennsylvania Coalition against Domestic Violence/Women of Color Caucus, an advocacy organization for women and families experiencing domestic violence.

Shelly coordinates conferences, seminars and HERL tours to raise career awareness with respect to helping people with disabilities. Shelly collaborates with local community organizations, such as Jr. Achievement, and with local school districts organizing job shadowing seminars with the aid of our graduate students. Shelly coordinated a “Job Shadow Day” in December. A group of students from North Hills Senior High Technology Education Department visited HERL, returned to their classrooms with the wheelchair user in mind, and developed the “Techno-Tray”. This wheelchair mounted tray is equipped with many gadgets found in high-end expensive automobiles, such as a GPS, device charger, and drink holder. In April these students revisited HERL and presented their project to our Faculty and graduate students.

Shelly also organizes the “State of the Science Rehabilitation Research to Practice Symposia Series” in support of the Military Amputee Research Program. The purpose of the workshops is to bring expert scientists conducting state-of-the-art research of immediate and future clinical relevance to the Army Medical Department, especially related to severely war injured soldiers requiring medical rehabilitation. The symposia project has allowed us to facilitate four one day workshops per year at Walter Reed Army Medical Center in Washington, DC. The sessions are open to everyone - civilian, government, layman, patient, family member, provider, academics, industry, and researchers.

Shelly’s dedication to Education and Outreach extends to writing and submitting grants to help fund academic programs connecting students with helping people with disabilities. Shelly plans to start doctoral level courses in social work in the fall.

Mary Goldberg oversees a few programs of great academic magnitude that are directed towards undergraduate, graduate, and Veteran students. Through the Quality of Life Technology Engineering Research Center (QoLT), a unique partnership between Carnegie Mellon University and the University of Pittsburgh, Mary coordinates “The Research Experience for Undergraduates” (REU) which is an NSF funded program supporting undergraduate students in engineering or technical fields in a mentored research experience. Underrepresented groups and schools outside of Pittsburgh that do not foster research programs are targeted to participate in this program. Mary is currently organizing an incoming group of interns that will spend this summer working with Faculty and graduate students on HERL projects.
Mary also coordinates “The Research Experience for Teachers” (RET) through the QoLT, exposing highly motivated teachers to the context of quality of life technology that have direct applicability in the classroom. This program engages educators in cross-disciplinary research with QoLT students, researchers, and clinicians in the fields of engineering, rehabilitation sciences, and social sciences, emphasizing the significant role of end users in engineering research. It seeks to prepare educators to introduce and integrate emerging QoLT technology in the classroom, sensitize educators to common concerns, barriers, and stereotypes experienced by older individuals and people with disabilities and create a pipeline of opportunities and personal contacts for students interested in pursuing engineering studies.

Mary was actively involved in preparing a grant proposal for the QoLT that was recently submitted to the National Science Foundation. “The Experiential Learning for Veterans in Assistive Technology & Engineering” (ELeVATE) is a comprehensive vocational rehabilitation program designed to prepare Veterans with disabilities for successful integration into engineering programs in higher education. Veterans will continue their rehabilitation therapy while participating in an experiential learning project. This program would include mentoring through research teams, study groups, counseling and Veterans support organizations in our region. The experiential learning and other preparatory activities will prepare Veterans for careers in engineering.

Mary is currently working on her doctorate in Education. -Andrea Bagay
2010 Winter Sports Clinic Research

2010 was another successful year for HERL research at the National Disabled Veterans Winter Sports Clinic in Snowmass, CO, where Veterans with disabilities compete in adaptive sports such as skiing, sled hockey, and rock climbing. We enrolled 107 subjects in the following 3 studies:

**Improving Seating Interface Fit and Pressure for Adaptive Skiing (PI: Brad Dicianno, MD):** We examined the seating interface pressures in a variety of sit skis, determined if a custom air bladder system can reduce interface pressure with better positioning, and used digital scanning technology to classify a series of adaptive ski molds that could be developed to suit the needs of a wide range of skiers.

**The Impact of Transfer Setup on the Performance of Independent Transfers**

(PI: Alicia Koontz, Ph.D.): Study participants performed wheelchair transfers to/from a custom-built, modular transfer station designed to emulate a variety of environmental conditions. The data collected in this study will help the U.S. Access Board develop guidelines to make recreational facilities accessible to persons with mobility impairments.

**Identification of Prosthetic Users Who Transition to Wheelchair Use for Primary Mobility (PI: Justin LaFerrier, MPT):** We collected feedback from lower extremity prosthetic users to determine the rate at which they switch to the use of a wheelchair for their primary means of mobility. We can use this data to identify common factors associated with prosthetic under-use, failure and/or abandonment. This information will be crucial to further research focused on prosthetic usage and the development of guidelines for prosthetic prescription that could be used by practitioners around the world to select the most appropriate assistive devices.

**HERL PUBLICATIONS**


HERL PUBLICATIONS


State of the Science Workshop: Care of the Combat Amputee

HERL and Walter Reed Army Medical Center’s (WRAMC) Department of Physical Medicine and Rehabilitation joined forces to host the first State of the Science Workshop in 2005. With the continuous support of numerous organizations, this effort has grown into an entire symposia series, bringing workshops several times a year to WRAMC. The workshops deliver to healthcare professionals the latest “state of the science” information needed to treat people with disabilities, especially returning wounded soldiers.

Rehabilitation experts from the VA, Department of Defense, universities, and private industry have gathered at the workshops to lecture on topics such as polytrauma, traumatic brain injury, and regenerative medicine.

The latest workshop on April 16, 2010 not only united experts to speak on rehabilitating combat soldiers with amputations, but also marked the publication of a monumental textbook. At the end of 2009, the Borden Institute of the Army’s Office of The Surgeon General published Care of the Combat Amputee as part of their Textbooks on Military Medicine series. This book was the published work of a three day symposium conducted in September 2007. Held at the Center for the Intrepid (CFI) at Brooke Army Medical Center (BAMC) in San Antonio, TX, the 2007 symposium united VA, civilian, and military experts in amputee care and rehabilitation to establish a consensus on standard of care issues and identify areas most needed for further clinical, technical, translational and developmental research. Care of the Combat Amputee was a joint VA/Department of Defense (DoD) effort and was Borden’s first textbook to be written in this manner. The textbook is also one of the first pieces of medical literature to focus on the optimal treatment and rehabilitation of young combat related amputees.

Because of the numerous military service members who have sustained severe limb trauma as a result of the Global War on Terrorism, Care of the Combat Amputee will provide a much needed “road map” to provide focus for those treating these wounded service members. COL Paul Pasquina, MD, Medical Director of the Amputee Program at WRAMC and HERL director Rory Cooper, Ph.D, were co-editors of the textbook.

The State of the Science Workshop on Care of the Combat Amputee opened with introductory remarks from Army Surgeon General LTG Eric B. Schoomaker, MD, PhD, WRAMC Commander COL Norvell V. Coots, MD, North Atlantic Regional Medical Command and WRAMC Commanding General MG Carla G. Hawley-Bowland. Later that morning, Acting VA Rehab Research & Development Deputy Director Patricia Dorn, Ph.D. joined the DoD leadership in recognizing individuals who’s hard work and dedication brought Care of the Combat Amputee to fruition.

Among those recognized for their efforts were Borden Institute Managing Editor Joan Redding and the team of HERL graduate students who helped write and compile the textbook chapters and wrote the book’s final chapter, summarizing the work and identifying areas for future research.
Several of the lead textbook authors returned to provide lectures in their area of specialty. Speakers covered the following topics in specific relation to service members with amputations: systems of care; military support systems; mental health; pain management; surgical considerations; medical complications; physical and occupational therapy; and future research.

Over 160 symposium attendees received a hard copy of Care of the Combat Amputee and had the opportunity to have their copy signed by LTG Schoomaker, MG Hawley-Bowland, GEN Franks, COL Pasquina, and Dr. Cooper. People lined up all the way from the WRAMC’s building 2 back entrance, past Joel auditorium and into the lobby during the once in a lifetime book signing.

PVA graciously sponsored a lunch in the Red Cross building where the audience was also treated to the premiere of a new documentary, “Unbeaten.” The film follows a group of wheelchair athletes for six days as they make their way in racing chairs and hand cycles in what is known as the toughest road race in the world, “Sadler’s Alaska Challenge.” The course winds 267 miles though the mountain passes of Denali National Park between Fairbanks and Anchorage. The filmmaker Steven Barber and his crew also presented Dr. Cooper with the first “Unbeatable Award” for serving as a great role model for wounded, ill and injured Soldiers.

The State of the Science symposium on Care of the Combat Amputee was one of the most successful workshops to date; over 160 people gathered to hear the latest advances in care from these respected leaders in military amputee care. Information about future State of the Science Workshops can be found at www.herlpitt.org or by contacting Shelly Brown at 412-954-5287. People who would like to receive e-mails announcing future workshops can join HERL’s workshop mailing list at https://list.pitt.edu/mailman/listinfo/workshop_announcements. The next workshop is planned for September 2010, on robotics. Health care professionals can earn continuing education credits by attending the State of the Science Workshops.


- Christine Heiner

Perceived Barriers to Exercise Research Study

The Reeve-Irvine Research Center is conducting a research study to determine more details about the perceived barriers to exercise experienced by men and women with spinal cord injuries. The information gained from this study will provide valuable information to scientists who study how exercise influences different aspects of health specific to SCI. They need this information in order to better create exercise programs that a large majority of people with SCI can participate in and that are effective for their health. For more information please contact Dr. Kim Anderson at kanderso@uci.edu or call 949-824-0056. All information will be kept strictly confidential.

Please note this research study is not being conducted at the Human Engineering Research Labs. However, this is an online study for qualified participants living in any part of the U.S.
How to subscribe to the HERL Newsletter:
Electronic mailing list: visit https://list.pitt.edu/mailman/listinfo/herlnewsletter
Print mailing list: Please call Christine Heiner at 412-954-5287 or e-mail heinercm@pitt.edu
All newsletters are archived on our website www.herlpitt.org.

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) 954-5287 or herlregistry@shrs.pitt.edu VAPHS, 7180 Highland Drive, 151R1-H, Pittsburgh, PA 15206