

The background of the cover is a photograph of a laboratory setting, overlaid with a semi-transparent orange filter. In the foreground, a person is seen from the back, sitting at a desk and looking at a computer monitor. In the background, another person is standing and holding a camera on a tripod. The overall scene suggests a research or engineering environment.

# THE HERL QUARTERLY

HUMAN ENGINEERING RESEARCH LABORATORIES  
VOLUME 22 NO. 4 | OCTOBER 2023

**PUBLICATIONS**

**ACCOLADES**

**COMMUNITY**

**ACTIVE STUDIES**

**THANK YOU**

# PUBLICATIONS

Sivakanthan, S., Cooper, R., Lopes, C., Kulich, H., Deepak, N., Lee, C. D., ... & Cooper, R. A.

Existing automated vehicle transportation guidelines and regulations have minimal guidance to address the specific needs of people with disabilities. Accessibility should be at the forefront to increase autonomy and independence for people with disabilities. The purpose of this research is to better understand potential facilitators and barriers to using accessible autonomous transportation.

Sivakanthan, S., Cooper, R., Lopes, C., Kulich, H., Deepak, N., Lee, C. D., ... & Cooper, R. A. (2023). Accessible autonomous transportation and services: a focus group study. *Disability and Rehabilitation: Assistive Technology*, 1-8.

Kulich HR, Collins D, Dicianno BE, Leykum L, Worobey L, Cooper RA, Koontz AM

Informal caregivers play an essential role in allowing individuals with disabilities to remain active in their homes and communities. However, caregivers who perform assisted transfers have a high risk of developing musculoskeletal pain and injuries. The current standard of care provides little training and education on proper transfer techniques, leaving informal caregivers underprepared to take on the roles and responsibilities associated with transfer-related activities of daily living. To address limitations in training and educational interventions, a tool called the Caregiver Assisted Transfer Technique Instrument (CATT) was developed to provide an objective method to evaluate proper technique of informal caregivers providing transfer assistance. Two research studies aimed to evaluate the psychometric properties of the CATT, including content validity, reliability, and construct validity of the CATT as a tool for clinical evaluation, and reliability and validity of the CATT as a tool for informal caregiver self-assessment. When assessing content validity after initial development, CATT items were rated favorably for their importance, clarity, and appropriateness of responses, and most items had excellent content validity ( $k^* > 0.75$ ). Feedback from participants led to the creation of two versions of the CATT: one for manual lifting techniques (CATT-M) and one for transfers performed via lift-based technologies (CATT-L). Both versions of the CATT demonstrated acceptable to strong levels of interrater reliability (ICCs: 0.720- 0.872) with varying levels of intrarater reliability (ICCs: 0.266 to 0.926). Individual item reliability varied from weak to strong, indicating the need for revisions on specific items. Concurrent and construct validity assessments revealed that total CATT scores were strongly correlated with Global Rating Scale scores from an expert clinician ( $r = 0.796$ ;  $p < 0.001$ ) and total scores correlated with caregiver age, level of education, hours of weekly care, pain, general health, and strength. While the intrarater reliability of the CATT was acceptable when used for self-assessment tool, there was no meaningful agreement between CATT expert raters and informal caregivers on their transfer technique when using the CATT. The results from these studies suggest that the CATT may be a reliable and valid tool for assessing assisted transfer technique of caregivers.

Kulich HR, Collins D, Dicianno BE, Leykum L, Worobey L, Cooper RA, Koontz AM. Development and content validity of the Caregiver Assisted Transfer Technique Instrument. *Assistive Technology Journal*. In press.

Cheng-Shiu Chung, Breelyn Styler, Eileen Li Wang, Dan Ding

An assistive robotic manipulator (ARM) is a viable solution for assisting daily manipulation activities for electric-powered wheelchair users with severe upper limb disabilities such as people with spinal cord injury, muscular dystrophy, stroke, or multiple sclerosis. Research studies have shown the benefit of ARM in assisting with daily tasks involving reaching, object handling, and manipulation [1]. ARMs can be mounted on an electric-powered wheelchair to support long-term daily use. One such example is the JACO/JACO2 manipulators (Kinova Robotics, Canada). Most power wheelchairs today feature integrated control, i.e., using a single control interface (e.g., joystick or head array) to operate two or more devices (e.g., power wheelchairs, mobile devices, or seating functions) [2,3]. Wheelchair-mounted ARM could be one of such devices [4]. The ARM users would need to switch between different control modes in order to use a 2-axis wheelchair joystick to control 7 degree-of-freedom (DOF) ARM and the pre-recorded ARM positions [5][6]. Research about ARMs has largely been on developing alternative user interfaces such as touchscreen, voice, gesture, electromyography (EMG), and brain-computer interface (BCI). There has been no research to date that examined how long-term owners of wheelchair-mounted ARMs are controlling their wheelchairs and ARMs daily, nor have the challenges they face, or their experiences been explored. This paper presents the results from an interview study conducted via Zoom with 11 long-term owners of wheelchair-mounted ARMs, where we inquired about and observed their practice in operating their ARMs and gathered their feedback on their perceived effectiveness.

Cheng-Shiu Chung, Breelyn Styler, Eileen Li Wang, Dan Ding. "Robotic Assistance in Action: Examining Control Methods for Long-Term Owners of Wheelchair-Mounted Robotic Arms." [https://www.resna.org/sites/default/files/conference/2023/NewEmergingTechnology/86\\_Chung.html](https://www.resna.org/sites/default/files/conference/2023/NewEmergingTechnology/86_Chung.html).

Adam J Sterczala, Kellen T Krajewski, Patrick A Peterson, Nicole M Sekel, Mita Lovalekar, Sophie L Wardle, Thomas J O'Leary, Julie P Greeves, Shawn D Flanagan, Christopher Connaboy, Bradley C Nindl

In the British Army, ground close combat roles have opened to women, however, they must pass the newly developed, gender-neutral Role Fitness Tests for Soldiers (RFT(S)). Due to physiological differences between sexes, training that optimally prepares both sexes for military occupational demands and the RFT(S) is needed. The purpose of this study was to determine the efficacy of a 12-week periodized strength and power programme with concurrent interval training on RFT(S) performance and determine if performance adaptations differed between sexes. 39 recruit-aged (18-35 yrs) participants, including 21 men ( $29 \pm 1$  yrs) and 18 women ( $27 \pm 1$  yrs), completed the study. Participants performed 3 training sessions per week that included strength and power resistance training followed by interval training. Pre- to post-training, improvements were observed for seated medicine ball throw (4.5%,  $p < 0.001$ ), casualty drag (29.8%,  $p < 0.001$ ), single lift (8.9%,  $p < 0.001$ ), water can carry (13.8%,  $p = 0.012$ ), repeated lift and carry (6.5%,  $p < 0.001$ ), 2-km load carriage (7.2%,  $p < 0.001$ ) and 2-km run (3.2%,  $p = 0.021$ ). Pre- to post-training improvements were also observed for maximal squat (27.0%,  $p < 0.001$ ), bench press (8.9%,  $p < 0.001$ ) and deadlift (24.6%,  $p < 0.001$ ) maximal strength, but not upper body power or aerobic capacity. No differences in RFT(S) improvements were observed between sexes, however men performed better than women in all RFT(S) and physical performance measures. Concurrent resistance and interval training improves military occupational performance in men and women; however, women may need more training than men to pass the gender-neutral RFT(S).

Sterczala AJ, Krajewski KT, Peterson PA, Sekel NM, Lovalekar M, Wardle SL, O'Leary TJ, Greeves JP, Flanagan SD, Connaboy C, Nindl BC. Twelve weeks of concurrent resistance and interval training improves military occupational task performance in men and women. *Eur J Sport Sci*. 2023 Jul 30;1-14. doi: 10.1080/17461391.2023.2239752. Epub ahead of print. PMID: 37517090.



# HERL ACCOLADES

Congratulations to Dr. Brandon Daveler, Jonathon Duvall, Dr. Alicia Koontz, and Dr. Mike Urbin on their VA awards! Dr. Daveler received the Career Development Award - Phase 1 (KO8), Dr. Duvall received the Career Development Award - Phase 2 (KO8), Dr. Koontz received the Research Career Scientist Award and lastly Dr. Urbin received the Merit Review Award (RO1)!

HERL has also received official award notices from NIDILRR for: RERC Transportation: Rory Cooper and Brad Duerstock (Purdue) and RERC "Power of Play": Ian Rice (UIUC and HERL Alum) and Rory Cooper



Andrea Sundaram won the Cooper-Johnson Award for his publication "Participatory action design and engineering of a manual wheelchair virtual coach including in-home and community usage"



On July 10th Dr. Rory Cooper had a busy day. In the morning he attended the Change of Responsibility Ceremony for the Commandant of the US Marine Corps. At noon he visited the US Patent and Trademark Office, where he had the privilege of meeting staff and surprising interns as their honored guest. Then in the afternoon he met with Denis Richard McDonough the Secretary of the US Department of Veterans Affairs, engaging in vital discussions concerning the welfare of our veterans.

On Thursday, July 20th, Dr. Cooper was invited to give a lecture to the Health Career Scholars Academy (UPHCSA). The Academy offers a distinctive and academically rigorous campus experience, combining theoretical knowledge with practical learning opportunities for its students. His talk was centered on the research conducted at HERL which was then followed by a very engaging Q&A session



On October 24, Dr. Rory Cooper was presented the 2023 National Medal of Technology and Innovation! This prestigious award is given to individuals in science and engineering who have made important contributions to the advancement of knowledge in various fields including behavioral and social sciences, biology, chemistry, engineering, mathematics, and physics. Rory A. Cooper, was recognized for his contributions in assistive technology and advancing accessibility.



On October 26th, Dr. Rory Cooper was honored at the National Inventor's Hall of Fame (NIHoF) Gala for his well-deserved induction!



A small group from the Wounded Warrior Regiment at Walter Reed visited HERL and completed an interactive workshop, resulting in the creation of a grilling set. This initiative allowed veterans to work with lathes, laser compartments, metal cutters, sharpeners, sanding, buffing, and more.



# HERL MAKING A DIFFERENCE IN THE COMMUNITY



Team HERL crossed the finish line, completing an empowering 60 miles for our veterans! We are honored to support and raise awareness for those who have served our country. A big shoutout to our dedicated team members for their perseverance and passion. Thank you to all who have cheered us on and contributed to this important cause!

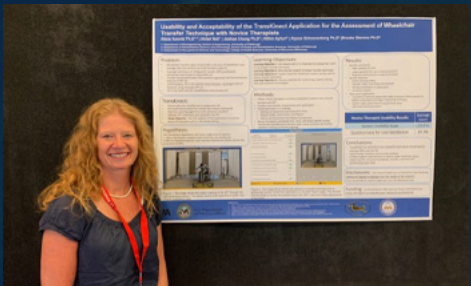


HERL participated in the 2023 National Veteran Wheelchair Games held in Portland, Oregon. It was an incredible opportunity for HERL to immerse itself in the world of adaptive sports and witness the resilience and determination of veteran athletes. Moreover, HERL had the privilege to conduct research studies during the games, allowing them to deepen their understanding of the unique challenges faced by veterans. The knowledge gained from this experience will further expand their expertise and continue making a positive impact on the lives of veterans through innovative assistive technologies.



Dr. Chung, Dr. Koontz, and Dr. Candiotti attended the RESNA 2023 Conference in New Orleans, Louisiana. While down there they had the opportunity to meet with HERL Alumni and colleagues during the Rehabilitation Science and Technology Alumni Reception! Drs. Chung and Candiotti were selected to present a 3-5 minute pitch of their research projects during the 'Minute Madness section'. "Stability Analysis of Alternative Power Wheelchair Dynamic Suspensions on Uneven Surfaces" – Dr. Candiotti and "Robotic Assistance in Action: Examining Control Methods for Long-Term Owners of Wheelchair-Mounted Robotic Arms" – Dr. Chung.

August 14-17 HERL Investigators, Dr. Alicia Koontz, Dr. Jorge Candiotti, Dr. Chang Dae Lee, Dr. Rory Cooper, and Rosi Cooper attended the PVA Healthcare Summit+Expo in Orlando, Florida. At the Summit, Dr. Koontz was selected to present her poster "Usability and Accessibility of the TransKinnect Application for the Assessment of Wheelchair Transfer Technique" with Novice Therapists.







HERL proudly was one of the sponsors for Disability Pride Pittsburgh! Our team members volunteered their time to participate in the event and advocate for research for the disabled community. Dr. Cooper also spoke at the event, highlighting the important work being done at HERL.



The University of Pittsburgh held its annual "Hail to Heroes" football game to honor service members, veterans, police, and first responders. Major General Rafferty, US Army Chief of Public Affairs, and father of two Pitt students, was honored, along with Pitt alumni serving in the military. LTC Yurocko of the PA Army National Guard delivered the Game Ball to MG Rafferty and Coach Narduzzi. A joint color guard, including ROTC cadets and representatives from various branches of the military, participated in the event.



Dr. Cooper had the opportunity to visit his alma mater, California Polytechnic State University, San Luis Obispo (Cal Poly), and speak to the cadets of the ROTC program.

The 2023 Invictus Games concluded in Dusseldorf, Germany. Dr. Cooper joined Team USA for their final training days and provided the Keynote Speech at their send-off dinner at the Museum of the US Army. He had the privilege of both contributing to the preparations for the games and attending the event.



The Pittsburgh ReelAbilities Film Festival was a resounding success, with a sold-out theater. "Bumps in the Road," a documentary about the Human Engineering Research Labs, was featured among the films shown during the festival. We extend our gratitude to Racheal Kittner and Alex Halpern for their work on the film.



The annual Veterans Scrimmage with Pitt football occurred on August 19! Dr. Cooper and Coach Narduzzi, the head coach of the Pitt football team, have jointly hosted this event for the past five years. Notable moments included bringing Veterans and players together to connect and enjoy a team lunch, touring the impressive facilities, and observing the dedication of the coaches and players during their training sessions. This event plays a pivotal role in reaffirming the values of selfless service, sacrifice, and leadership among Veterans, players, and staff alike!



HERL Investigators participated in the Steel wheelers 5k in early October!

HERL investigator Dr. Jonathan Duvall has been approved as a new board member for Spectrum Charter School. Spectrum Charter School employs innovative, out-of-the-box educational programs and support services designed to foster substantial and quantifiable student growth and achievement.



Shivakanthan, HERL Post - Doc participated in the All Wheels Up Global Forum on Wheelchair Accessible Air Travel in Washington, D.C., with the aim of advocating for a more inclusive world, particularly in the realm of air travel accessibility.



Dr. Cooper gave the RESNA Colin McLaughlin Lecture fireside chat with Carmen P. DiGiovine, PhD, ATP/SMS, RET the president of RESNA

# HERL IS HIRING!



# ACTIVE STUDIES



Your participation in this research study will not impact whatsoever any current or future services you receive from SCU.

INTERESTED IN THE APP FOR CLIENTS OF SERVICE COORDINATION UNLIMITED?

PLEASE CALL/EMAIL THE STUDY COORDINATOR  
ZARA AMBADAR  
EMAIL: AMBADAR@PITT.EDU  
PHONE: 412-608-6118

**YOU ARE ELIGIBLE TO PARTICIPATE IF:**

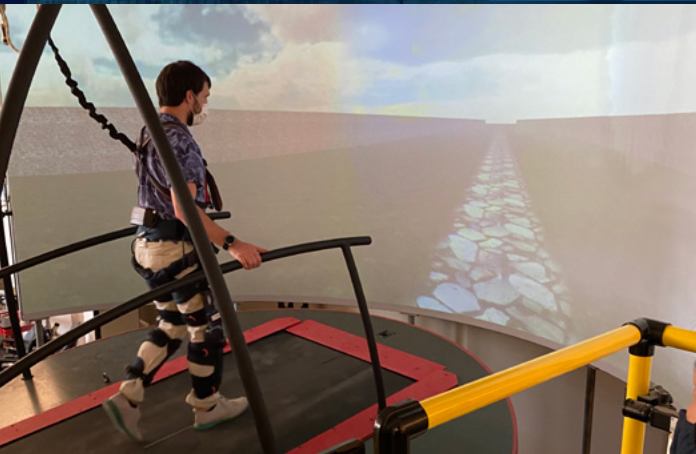
- Have a disability
- Receive Service Coordination via SCU
- Able to Use Smart Phone or Tablet

**WHAT IS INVOLVED:**

- Try using our smartphone app
- Give feedback about the app in interviews (~ 60 mins)
- Interview can be over the phone or zoom meeting, and scheduled at your convenience
- Study participants will receive compensation for their time

NOTE: We can provide the phone or tablet if needed.

Principal Investigator: Dan Ding, Ph.D.



This research study will compare the biomechanical performance of the Keeogo knee stress-relief powered exoskeleton to a passive knee brace in people with knee osteoarthritis (OA).

This study will require two visits and 12 weeks of at-home in-wheel suspension use. During your first lab visit, you will be asked to complete a standardized mobility course of various surfaces and obstacles you may encounter during daily activities of living. You could earn up to \$250 for your time!

FOR MORE INFO ON EFFECTS OF IN-WHEEL SUSPENSION IN REDUCING VIBRATION, NECK, AND BACK PAIN STUDY CALL 412-407-2047 AND MENTION "IN-WHEEL SUSPENSION STUDY"

**YOU ARE ELIGIBLE TO PARTICIPATE IF:**

- 18 YEARS OR OLDER
- Have a medical diagnosis of grade 3 or 4 knee OA.
- Have used a prescribed knee brace for at least three months.
- Self-reported knee pain when standing, walking, climbing stairs, squatting, or other mobility activities.
- Self-reported limitations to mobility and walking activities due to knee pain, stiffness, or loss of range of motion.
- Can provide a signed physician release form confirming the medical diagnosis and no medical complication or co-morbidity that will be contraindicated for wearing the device or walking (e.g., cardiovascular disorders, pressure ulcers, open wounds, lower limb vascular disorders, or other medical conditions).

Principal Investigator: Alicia Koontz, PhD



This study will require two visits and 12 weeks of at-home in-wheel suspension use. During your first lab visit, you will be asked to complete a standardized mobility course of various surfaces and obstacles you may encounter during daily activities of living. You could earn up to \$250 for your time!

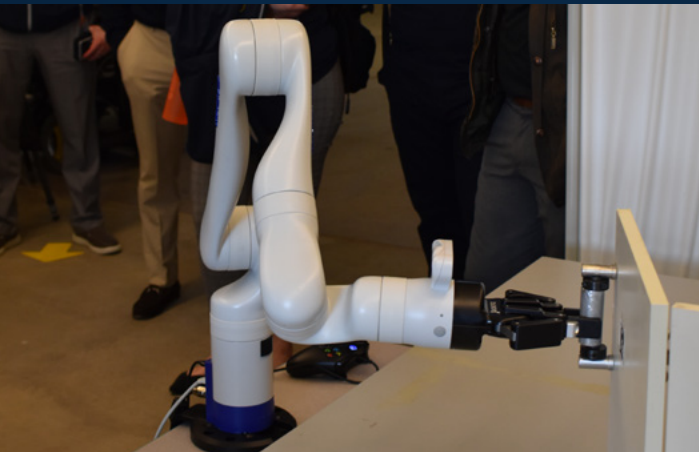
FOR MORE INFO ON EFFECTS OF IN-WHEEL SUSPENSION IN REDUCING VIBRATION, NECK, AND BACK PAIN STUDY CALL 412-407-2047 AND MENTION "IN-WHEEL SUSPENSION STUDY"

The purpose of this research study is to examine how in-wheel suspension in manual wheelchairs changes vibrational exposure and how this impacts pain and fatigue.

**YOU ARE ELIGIBLE TO PARTICIPATE IF:**

- You have an SCI which occurred at least one year ago
- You use a manual wheelchair full time (>30 hours per week)
- You use a manual wheelchair with 24" or 25" quick-release wheels
- Your wheelchair does not have in-frame suspension elements
- You weigh under 265 lbs. (weight limit of suspension wheels)
- You have moderate chronic neck or back pain

Principal Investigator: Dan Ding, PhD



This study will be completed in six hours - either in one session or multiple sessions - and is located at our Human Engineering Research Labs (Bakery Square, 6425 Penn Ave., Suite 400, Pittsburgh, PA, 15206). Participants will receive \$25 per hour and up to \$150 for completing the study.

INTERESTED IN THE ROBOTIC ARM STUDY? CALL 412-822-3705 FOR MORE INFORMATION

**YOU ARE ELIGIBLE TO PARTICIPATE IF:**

- You have an SCI which occurred at least one year ago
- You use a manual wheelchair fulltime (>30 hours per week)
- You use a manual wheelchair with 24" or 25" quick-release wheels
- Your wheelchair does not have in-frame suspension elements
- You weigh under 265 lbs. (weight limit of suspension wheels)
- You have moderate chronic neck/ or back pain

**YOU MAY NOT BE ELIGIBLE TO PARTICIPATE IF YOU:**

- Have impaired vision
- Have pressure ulcers that prevent you from sitting continuously for a long period of time



Principal Investigator: Adam Sterczala, Ph.D



**YOU MAY BE ELIGIBLE TO PARTICIPATE IF YOU ARE:**

Individuals with SCI that occurred at least 12 months ago and:

- Use a manual wheelchair full time.
  - Can independently transfer.
  - Are willing to complete two blood draws and one muscle biopsy.
  - Can operate a handcycle and/or arm ergometer
- OR
- Healthy Veterans able to:
- Complete two blood draws and one muscle biopsy.
  - Operate a handcycle and/or arm ergometer

**FOR MORE INFORMATION OR TO CHECK ELIGIBILITY, CALL 412-822-3685 AND MENTION THE IRISIN SCI STUDY**

Join our research study to learn about the connection between irisin (muscle secreted bone mediating protein) and bone health in individuals with spinal cord injury (SCI). This study will also explore whether exercise can increase irisin concentrations in circulation.

**PARTICIPANTS WILL BE ASKED TO:**

- Spend three hours at the University of Pittsburgh's Neuromuscular Research Laboratory.
- Spend two hours at VA Pittsburgh Healthcare System's Research Office Building.
- Complete questionnaires.
- Have three bone scans.
- Perform an arm ergometer maximal exercise test and an arm ergometer high-intensity interval exercise bout.
- Undergo two blood draws and one upper leg muscle biopsy.
- Be compensated up to \$120 for individuals with SCI or \$80 for healthy Veterans

Principal Investigator: Alicia Koontz, PhD



This is a research study conducted by the University of Pittsburgh. The purpose of this study is to examine the Caregiver Assisted Transfer Technique Instrument (CATT), which has been developed as a tool to assess proper technique of caregivers who provide transfer assistance to individuals with physical disabilities.

**YOU MAY BE ELIGIBLE TO PARTICIPATE IF YOU ARE:**

- Over the age of 18 years old
- Routinely provides transfer assistance to an adult with a physical disability for at least two years
- Served as a caregiver for at least three months
- Have no formal training on assisted transfer techniques

This study will require two visits for care recipients and up to four visits for caregivers, and you will have the option to participate remotely in your home. For the first visit, you will be asked to complete surveys and perform routine transfers to be evaluated. For the second visit you will be asked to perform the same transfer procedures as visit one. Visits three and four for caregivers involve completing an online assessment of their transfer skills. Care recipients could earn up to \$50 and caregivers could earn up to \$100 for participation in the study. Caregivers will be given the opportunity to participate in an option sensor portion of the study for an additional \$50.

**THE CAREGIVER ASSISTED TRANSFER TECHNIQUE (CATT) STUDY IS ACCEPTING PARTICIPANTS THROUGH DECEMBER 2023!**

Thank you to all research participants who have volunteered their time to participate in our HERL studies! We value the contributions and loyalty to HERL and we look forward to continued participation in HERL research activities.

# WISHING YOU GOOD HEALTH AND GREAT CHEER THIS HOLIDAY SEASON!

**Our mission here at HERL is to continuously improve the mobility and function of people with disabilities through advanced engineering in clinical research and medical rehabilitation**

**Our vision is to create a world where all people with disabilities have unencumbered mobility and function so that they can fully participate in and contribute to society. Without all your support and donations, HERL wouldn't be what is without you today and for that we thank you!**

- RORY COOPER, PHD**  
Director
- BRAD DICIANNO, MD**  
Medical Director
- ALICIA KOONTZ, PHD, RET**  
Senior Associate Director for Research
- ROSEMARIE COOPER, MPT**  
Associate Director for Stakeholder Engagement
- GARRET GRINDLE, PHD**  
Associate Director for Engineering
- BARB KLIPA, MBA**  
Assistant Director for Finance & Research Administration
- GINA MCKERMAN, PHD**  
Assistant Director for Data Science
- D. JOSHUA MARINO, MS, ATC**  
Assistant Director for Education and Outreach
- NIKITHA DEEPAK, MS**  
Assistant Director for Research Coordination and Regulatory Compliance

# THANK YOU

SUBSCRIBE TO OUR NEWSLETTER MAILING LIST

FOLLOW US ON SOCIAL MEDIA



VA Office of Research and Development  
VA Pittsburgh Healthcare System



University of Pittsburgh



National Institute on Disability, Independent Living and Rehabilitation Research



National Science Foundation



US Department of Transportation - University Transportation Center



Paralyzed Veterans of America



Scan to follow HERL's social media!

## CONTACT HERL

6425 Penn Avenue, Suite 400

Pittsburgh, PA 15206-4022

Phone: 412-822-3700

Fax: 412-822-1079

Email: [herl@groups.pitt.edu](mailto:herl@groups.pitt.edu)