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ABSTRACTS

USABILITY AND TASK LOAD COMPARISON BETWEEN A ROBOTIC ASSISTED TRANSFER DEVICE AND A MECHANICAL FLOOR LIFT DURING CAREGIVER ASSISTED TRANSFERS ON A CARE RECIPIENT

Mark Greenhalgh, Eline Blaauw, Nikitha Deepak, C. O. L Matthew St. Laurent, Rosemarie Cooper, Roxanna Bendixen, Alicia M. Koontz, & Rory A. Cooper

The RATD represents a novel methodology to reduce strain, maneuvering, and cognitive load a caregiver experiences when conducting transfers on a mannequin. However, caregivers who used this new technology report suggested adjustments regarding the robot's human machine interface and shape as to improve transfer efficiency and comfort for care recipients. The purpose of this study was to test a redesigned RATD and compare its ergonomics during a transfer to those of a mechanical floor lift.

FUNCTIONAL MOBILITY, EMPLOYMENT AND SAFETY BENEFITS OF SEAT ELEVATING DEVICES

Matthew J. Mesoros, Richard M. Schein, Gede Pramana ,Vince J. Schiappa, Mark R. Schmeler, & Brad E. Dicianno

Seat Elevating Devices (SEDs) allow vertical movement of the seat of a power wheelchair (PWC), so users can perform activities of daily living including transferring and reaching. RESNA's position papers on SEDs and the wheelchair provision process highlight the benefits of SEDs and the need for outcome measurement. The Functional Mobility Assessment (FMA) is a satisfaction measure to carry out specific tasks including transferring and reaching. The purpose of this retrospective study was to evaluate the relationship between use of SEDs on the FMA and uniform dataset (UDS) with a sample of 1,733 PWC users. Independent samples t-tests and Mann-Whitney U tests were used to compare total FMA and individual FMA items scores between those with and without a SED. A univariate linear regression model was used to control for confounding variables and determine if SEDs were a predictor of variance in FMA. Those with SEDs had significantly higher total FMA percentage score (mean = 76.7 ± 20.9) than those without SEDs (mean = 59.6 + 24.7; t=11.9, p<.001). Those with SEDs had significantly higher reach (U=99849.0, p<.001) and transfer (U=140587.0, p<.001) scores. The functional, vocational, and safety benefits of SEDs should be considered when determining coverage for SEDs.

EVALUATION OF ROLLING RESISTANCE IN MANUAL WHEELCHAIR WHEELS AND CASTERS USING DRUM-BASED TESTING

Joseph Ott, Holly Wilson-Jene, Alicia Koontz, & Jonathan Pearlman

Rolling resistance is a drag force that increases the required propulsion force of manual wheelchair users (MWU) and increases the risk of upper extremity pain and injury.

EMERGING TECHNOLOGIES IN NEUROENGINEERING TO ADVANCE REHABILITATION, IMPROVE QUALITY OF CARE DELIVERY, AND ENCOURAGE INDEPENDENT LIVING

Mark Greenhalgh, Jonathan Duvall, Jorge Candiotti, Cheng Siu Chung, Kendra Jorgensen Waters, George Smolinksi, Sara Peterson, Urs Schneider, Rosemarie Cooper & Rory A. Cooper

Clinical and engineering advancements from rehabilitation sciences, medicine, psychology, and bioengineering are becoming more appealing, as they provide those with neurological disabilities, and the people that care for them, the confidence and assistance to live independently (Kirby et al., Arch Phys Med Rehabil 99: 1295–1302, 2018; Dicianno et al., Mil Med 183: e518–e525, 2018). The purpose of this chapter is to provide an overview and examples of emerging clinical technologies assisting people with disabilities as they increasingly become independent, participating members of society. In completing the chapter, the reader should understand (1) technology design and research; (2) clinical applications for neuroengineering; and (3) translation for activities of daily living. Examples discussed will include neurostimulation as well as assisted robots, adaptable aids, mobile health (mhealth), internet of things, and telehealth. The reader will then be provided with a discussion recapping each section while providing additional detail on their long-term benefits and potential future research.

ESTABLISHING CONTENT VALIDITY EVIDENCE OF THE PITTSBURGH IMPAIRMENT TESTING TOOL (PITT) FOR ADULTS WITH SPINA BIFIDA

Alan Cuevas Villagomez, Gina McKernan, Amy J. Houtrow, Brad E. Dicianno

Current scales to measure motor impairment in adults with spina bifida (SB) are limited by their complexity, variable interpretation (i.e., subjectively defined impairment levels), or inclusion of muscles groups that are not always practical to test in a clinical setting.

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"NOTHING ABOUT US WITHOUT US:" ENGAGING AT USERS IN AT RESEARCH

Alicia Koontz, Jonathan Duvall, Reva Johnson, Tim Reissman, Emma Smith

The powerful slogan "nothing about us without us" has been a motto of the disability rights movement for decades – and still remains a powerful reminder of the work we have yet to do. While assistive technology (AT) research is motivated by the needs of people with disabilities, as members of the AT community we recognize that there remains an alarming lack of representation of people with disabilities in AT research and development roles. In the U.S., people with disabilities are less likely to work in STEM fields when compared to their peers without disabilities; further, despite comprising 25% of the population, people with disabilities make up only 1% of medical students (CDC, AAMC). The lack of representation in STEM and medical fields translates into fewer people with disabilities leading and even participating in AT research and development. To add to the efforts being done to increase representation, we aim to first state that the Assistive Technology Journal believes in and supports engagement of AT users in all aspects of AT research; and further, we prioritize publications that demonstrate such inclusion.

RELIABILITY OF 3D DEPTH MOTION SENSORS FOR CAPTURING UPPER BODY MOTIONS AND ASSESSING THE QUALITY OF WHEELCHAIR TRANSFERS

Alicia Marie Koontz, Ahlad Neti, Cheng-Shiu Chung, Nithin Ayiluri, Brooke A. Slavens, Celia Genevieve Davis, and Lin Wei

Wheelchair users must use proper technique when performing sitting-pivot-transfers (SPTs) to prevent upper extremity pain and discomfort. Current methods to analyze the quality of SPTs include the TransKinect, a combination of machine learning (ML) models, and the Transfer Assessment Instrument (TAI), to automatically score the quality of a transfer using Microsoft Kinect V2. With the discontinuation of the V2, there is a necessity to determine the compatibility of other commercial sensors. The Intel RealSense D435 and the Microsoft Kinect Azure were compared against the V2 for inter- and intra-sensor reliability. A secondary analysis with the Azure was also performed to analyze its performance with the existing ML models used to predict transfer quality. The intra- and inter-sensor reliability was higher for the Azure and V2 (n = 7; ICC = 0.63 o 0.92) than the RealSense and V2 (n = 30; ICC = 0.13 to 0.7) for four key features. Additionally, the V2 and the Azure both showed high agreement with each other on the ML outcomes but not against a ground truth. Therefore, the ML models may need to be retrained ideally with the Azure, as it was found to be a more reliable and robust sensor for tracking wheelchair transfers in comparison to the V2.

HERL'S SUMMER RESEARCH PROGRAMS: CONTINUED SUCCESS

The Human Engineering Research Laboratories have once again completed a successful cohort of our summer research programs! During the summer of 2022, we welcomed 24 students from around the nation into the American Students Placement in Rehabilitation Engineering (ASPIRE) and Experiential Learning for Veterans in Assistive Technology and Engineering (ELeVATE) programs, as well as the inaugural cohort of the VA Learning Opportunities in Research (VALOR) program. In addition to graduate and undergraduate researchers, we were also fortunate to include two cadets of the US Military Academy at West Point in our projects and activities.

Program participants engaged in hands-on design, development, and analysis of active research projects under the tutelage of experienced graduate student and faculty mentors. Each week saw different HERL researchers leading workshops designed to increase participants' knowledge of and abilities in the fields of rehabilitation engineering and medical device design. Participants completed assigned deliverables based on the work they had completed, and these papers and scientific posters were displayed at the end-of-term HERL Student Symposium and Open House. Mr. Donald Koenig, director of the VA Pittsburgh Healthcare System, was happy to present awards to the respective winners of the Best Paper, Best Poster, and Best Elevator Pitch competitions.

J. MATTHEW LANDIS

J. Matthew Landis, HERL Alumnus and past ELeVATE program participant spoke at the 2022 Student Symposium and Open House. Mr. Landis detailed how his experience at HERL influenced his career path. Wounded in service of the US Army, he found inspiration to rehabilitate and use the skills he had learned through his own experiences and those of his son, man with Autism. Mr. Landis returned to college in pursuit of a degree in Electrical Engineering at the Swanson School of Engineering within the University of Pittsburgh and discovered Dr. Cooper's mission with HERL. After his graduation, he joined the HERL team and drove advancements behind several active projects. Mr. Landis is currently working with Senior Program Manager for Near Earth Autonomy's Inspection Program.

INTERN REVIEWS

"As my internship comes to a close I just wanted to send my gratitude to Rory A. Cooper, PhD, PLY and the fabulous staff here at University of Pittsburgh's, Human Engineering Research Laboratories.

I had the pleasure to be able to learn from high prestige researchers and take life lessons from each and everyone of those amazing people. Working in a facility that specializes in engineering products that cater towards bettering the lives of people with disabilities."

Aaron Amanios
University of California Merced

"Last week I concluded my research at the Human Engineering Research Laboratories as a VALOR Intern. The internship was an immersive experience into the world of Rehabilitation Engineering, a field I had yet to explore. During my time I learned technical and professional skills that would help to further my journey as an engineer.

I would like to especially thank Rory A. Cooper, PhD, PLY and Shantanu Satpute as my mentors on the Powered Personal Transfer System project. Along with D. Joshua Marino who helped all the interns by providing resources, organizing workshops, and allowing for a smooth transition. Thank you to everyone at HERL who provided a wonderful working environment."

Angel Koshy
University of North Carolina at Charlotte

"I am incredibly grateful for the opportunity to spend my summer working at Human Engineering Research Laboratories as an ASPIRE intern. This experience allowed me to explore the field of Rehabilitation Engineering and further develop my technical and professional skills in machine learning, technical writing, and presenting.

I would like to thank Dr. Alicia Koontz and Ahlad Neti for serving as my mentors on the TransKinect application project. Additionally, I would like to thank D. Joshua Marino as the coordinator of the ASPIRE, VALOR, and ELEVATE programs, as well as Rory A. Cooper, PhD, PLY as the head of HERL and the rest of the staff."

Jordan Witt
Messiah University

HERL HIRES

Libby Powers has accepted an extended role of Research Participant Advocate after being a Research Assistant for 3 years. In this position she will make sure all research participants will be well attended for! Also, congratulations to Libby for she was selected as a board member for the Pennsylvania State Center for Independent Living Council.

Abigail Albright, a past HERL intern and recent Grove City College graduate, has assumed the role of the Communications Coordinator. You will be seeing her work across HERL's social media platforms and upcoming HERL Newsletters including this one! Welcome Abigail!

Wei Dang has accepted a position as a Research Coordinator. Wei will be working with the Research Coordination and Regulatory Compliance team at HERL. With her undergraduate study in kinesiology from China and masters in rehabilitation science from University of Minnesota she will be an asset to HERL! Welcome Wei!

RECOGNITIONS AND AWARDS

Alicia Koontz became a member of RESNA's 2022-2023 Education committee.

Alhad Neti, Allison Brunswick and Hailee Kulich have all been accepted for Paper Presentations at the International Seating Symposium April 13-15 in Pittsburgh!

Josh Marino was highlighted in the Summer Veteran Affinity Group Newsletter under Pitt Profiles.

Saleh Alqahtani officially graduated with a PhD in Rehabilitation Science and Technology.

Dr. Rory Cooper was a member of the team awarded the 2022 AUSA Creighton Abrams Medal presented to the U.S. Army Civilian Aide to the Secretary of the Army (CASA) program. This award is given each year to an individual or organization contributing highly to the advancement of the United States Army.

Dr. Rory Cooper received the Rehabilitation Engineering & Assistive Technology Society (RESNA) Colin McLaurin Distinguished Lectureship Award for 2022.

CONGRATS HERL ALUMNI

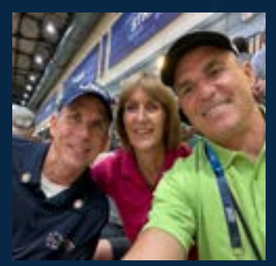
Fabrisia Ambrosio accepted a position at Harvad as the naugural Atlantic Charter Director of the Discovery Center for Musculoskeletal Recovery within the Spaulding Rehabilitation Institute and will help launch the new Mass General Brigham Gene and Cell Therapy Center, which is a large initiative that aims to accelerate the translation of regenerative medicine approaches to the clinic.

Nate Hogaboom a HERL and SHRS alumnu was the Jayanath Award Lecture Speaker for the 2022 ASCIP Educational conference.

HERL OUT AND ABOUT

HERL partnered with Scouts BSA and the US Patent and Trademark Office (USPTO) to support STEM Education, and USPTO Inventing Program as boys and girls from Pennsylvania and across the USA (live and through remote access) work to earn the Scouting Inventing Merit Badge.

HERL helped sponsor the Spinal Cord Injury Fair in Bakery Square hosted by the Ryan Shazier Fund.



Dr. Rory Cooper and Rosi Cooper assisted with The 2022 Department of Defense Warrior games at the ESPN Wide World of Sports Complex in Orlando, Florida.

HERL Team members Nikitha Deepak, Alicia Koontz, and Jorge Candiotti attended the 2022 PVA HealthCare Summit + Expo down in Dallas, Texas.

Dr. Cooper met with Dr. Urs Schneider of the Fraunhofer Institute to update on joint projects and explore further collaborations with HERL.

The Coopers and Garrett attended and presented at the REHA Care 2022 in Dusseldorf Germany and ran into HERL alum, Dr. Jongbea Kim with some of his students!

STILL IN NEED OF PARTICIPANTS FOR OUR STUDIES

CAREGIVER ASSISTED TRANSFER TECHNIQUE STUDY

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

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.

REVIEW FROM PAST PARTICIPANT

Quinne Johnson, a second year OT student at Pitt, said “you will not only be compensated for your time but you will also be gaining some insight into the future of technology in the rehab field.” She highly recommended participating in this study if you meet the eligibility requirements and have even the slightest of interest in rehabilitation technology!

THE CARE GIVER ASSISTED TRANSFER TECHNIQUE (CATT) STUDY IS ACCEPTING PARTICIPANTS THROUGH DECEMBER 2022!

QLX WHEELCHAIR LOCKING SYSTEM-USER ASSESSMENT

Principal Investigator: Rory A. Cooper, PhD

The purpose of this study is to obtain user feedback on a wheelchair locking system developed by BraunAbility, a wheelchair accessible vans manufacturer. The system is intended to address the challenge of providing a safe, usable, and convenient wheelchair locking system in a personal motor vehicle, with minimal compromise of the driving performance of the wheelchair within the home and

YOU MAY BE ELIGIBLE TO PARTICIPATE IF YOU ARE:

- Over the age of 18 years old
- You use a power wheelchair as your primary means of mobility
- You agree to ride as a passenger in the study vehicle and drive/ride the study wheelchair

If you decide to participate, you will be asked to complete a wheelchair driving assessment and a vehicle riding assessment on a closed-circuit driving course using study vehicle/wheelchair and your personal vehicle/wheelchair. You will also be asked to complete questionnaires to provide information about yourself as well as your experiences with the system. You may be compensated up to $110 for your participation! Our stake holder engagement team will be present to provide snacks and drinks and make sure participants are comfortable in our warming tent!

THIS TIME SENSITIVE STUDY WILL BE CONDUCTED STARTING OCTOBER 31 - NOVEMBER 17 AT THE PITTSBURGH INTERNATIONAL RACE COMPLEX, WAMPUM, PA IF INTERESTED CONTACT OUR RESEARCH COORDINATORS AT 412- 417-7923 OR EMAIL NID51@PITT.EDU BY OCTOBER 26TH, TO ACCOMMODATE PREFERRED DATES ON THE TRACK.

DEVELOPMENT AND EVALUATION OF POWERED PERSONAL TRANSFER SYSTEM (PPTS) FOR WHEELCHAIR USERS

Principal Investigator: Rory Cooper, PhD

This research study will collect feedback from rehabilitation professionals and caregivers on the PPTS transfer process and the new custom seating system.

YOU MAY BE ELIGIBLE TO PARTICIPATE IF YOU ARE:

- Are over the age of 18 years.
- Weigh less than 250 pounds (weight limit of device).
- Fit an 18-inch-wide and 18-inch-deep seat.
- Are a rehabilitation professional (therapists, caregivers, physicians, nurses, attendants and aides) with experience transferring adults with complex disabilities who use Electric Power Wheelchair (EPW)

PARTICIPANTS WILL BE ASKED TO:

- Transfer a rescue dummy from the EPW to the bed using PPTS.
- Compare the test wheelchair with the original manufacturer's seating by maneuvering the wheelchairs through a few obstacles and evaluating them through a series of questionnaires.
- Complete additional testing of the PPTS which will involve evaluating the transfer process, if needed.

The study will take one visit lasting no longer than three hours. Participants may be compensated up to $80 for completing the study. Location: Human Engineering Research Laboratories (Bakery Square, 6425 Penn Ave., Suite 400, Pittsburgh, PA, 15206). CALL 412-417-7923 for more information!

THE CARE GIVER ASSISTED TRANSFER TECHNIQUE (CATT) STUDY IS ACCEPTING PARTICIPANTS THROUGH FEBRUARY 2023!

THANK YOU FROM RESEARCHER

"I would like to extend our appreciation to all the research participants who were able to partake in the testing of the Powered Personal Transfer System (PPTS). We are still recruiting caregivers and clinicians to participate in the testing this novel robotic transfer technology. We really value your participation look forward to your continued support with our research."

- SHANTANU SATPUTE

A THANK YOU TO OUR PARTICIPANTS!

Thank you to all our research particIpants who have volunteered your time to help us with our reserach here at HERL! Your time and efforts have helped us tremendously in our studies. We hope to continue the research that we are doing at HERL to improve everyone's quality of life.

FOR MORE OPPORTUNITIES LIKE THIS CHECK OUT HTTPS://WWW.HERL.PITT.EDU/PARTICIPATE

HAPPY HOLIDAYS

May the holiday season end the present year on a cheerful note and make way for a fresh and bright New Year. Here's wishing you a Happy Holidays!

Sincerly,

THE HERL TEAM

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 and 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!

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