

# HERL QUARTERLY

VOLUME 23, NO. 2  
APRIL - JUNE 2024



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HERL SPOTLIGHT

William James Schoy IV

Research Participant Advocate

Hi Readers! My name is William and I am the Research Participant Advocate here at HERL. I work with study participants visiting the lab, participate in mock trials to improve participant experience, and coordinate the lab's community outreach: collaborating with stakeholders, engaging with the community, and supporting advocacy efforts.

I earned a master's degree in education from the University of Pittsburgh in Spring 2023 and was honored to have gone to Kenya in the Summer of 2023 as part of a Fulbright Hayes Group Project Abroad trip Cultures of innovation: Intersections of Social Studies and STEAM. This experience reinforced and deepened my commitment to fostering authentic, enduring, and reciprocal relationships with community partners as fundamental practice.



THANK YOU FOR READING!

Stay tuned for our next newsletter in October.  
*Digital signup link on reverse.*



Left to right: Jorge Candiotti, Sivashankar Sivakanthan, and Shantanu Satpute.

Our Affiliations



# Upcoming Events

Important save-the-dates for events HERL will be hosting or participating in.

- June 21-30:** Warrior Games
- July 15-19:** 46th Annual IEE-EMBS Conference - *Dr. Cooper Keynote Speaker*
- July 23:** HERL's 30th Anniversary & Open House
- July 25-30:** National Veterans Wheelchair Games
- August 24-30:** PVA Summit & Expo
- September 1-8:** Paris Paralympics
- September 16-25:** 58th DGBMT Annual Conference on Biomedical Engineering - *Dr. Cooper Keynote Speaker*

## HERL AWARDEES

RESNA 2024 STUDENT  
SCIENTIFIC PAPER COMPETITION

WINNER

**Shantanu Satpute**

Graduate Student Researcher

Shantanu writes of his achievement:

"I am honored to receive this award and am especially happy that RESNA has identified and acknowledged our work involving people with disabilities in our research to improve lives. It's particularly meaningful knowing that my work involving people with disabilities in engineering design is making a difference. I feel privileged to have the opportunity to work at HERL with such a supportive team. I couldn't have done it without them."



RUNNER-UP

**Ahlad Neti**

HERL Alum





# Publications Manuscripts

DISABILITY AND REHABILITATION: ASSISTIVE TECHNOLOGY  
https://doi.org/10.1080/17483107.2024.2329427



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RESEARCH ARTICLE

Check for updates

Relationship between employment and adaptive video gaming in individuals with physical disabilities

Drew H. Redepenning<sup>a,b</sup>, Mitch Bell<sup>a</sup>, Oluwasanmi Adenaiye<sup>a,b</sup> and Brad E. Dicianno<sup>a,b</sup>

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ABSTRACT

**Purpose:** The purpose of this study was to assess employment characteristics of individuals with physical disabilities who currently participate in adaptive gaming and determine if there is a positive association between adaptive gaming and employment.

**Materials and methods:** A survey was administered to individuals with disabilities who currently use adaptive video gaming equipment to gather information on demographics, gaming habits, employment characteristics, and subjective benefits of gaming on employment.

**Results:** The study included 606 participants. Over 57% of participants reported full-time or part-time employment. Nearly half of the participants reported using their equipment either most or all of the time to complete tasks related to work. Participants using their equipment to complete work tasks most or all of the time were more likely to be employed full-time ( $p=0.0021$ ). Over 73% of participants reported subjective benefits of adaptive video gaming on their employment.

**Conclusions:** Participants in this study had higher rates of employment compared to national averages for individuals with physical disabilities. More frequent use of adaptive gaming equipment for work was associated with a higher likelihood of full-time employment. Most participants who were employed reported subjective benefits of adaptive gaming on employment through improvements in mental health, physical function, and cognition.

IMPLICATIONS FOR REHABILITATION

- Participation in recreational activities has been shown to be associated with increased rates of employment for individuals with physical disabilities.
- Employment rates for those who participate in adaptive video gaming were found to be higher compared to individuals with disabilities in the general population.
- Adaptive video gaming may lead to increased rates of employment through improvement in mental health, physical function, and cognition.

Introduction

The proportion of the population that actively engages in video gaming has increased significantly over the past few generations. It is estimated that greater than 50% of individuals born after 1995 have some engagement in video gaming, and 82% of individuals born between 1981 and 1994 are involved in gaming [1]. For individuals with disabilities, the greater availability of adaptive controllers has now allowed this population to participate in video gaming as well as competitive esports [2,3]. Though there is often a negative stigma surrounding video gaming, multiple studies have now shown that it can have a positive effect on mental health and wellbeing in the general population [4,5]. In a previous survey study, over 90% of individuals with physical disabilities reported an improvement in quality of life from participation in adaptive video gaming [6]. However, the indirect benefits of participation in adaptive video gaming have yet to be explored in this population.

For individuals with physical disabilities, participation in recreational activities has been shown to be associated with employment. Individuals with spinal cord injury who participated in organized sports were 2.1 times more likely to be employed [7]. Playing an additional year of adaptive sports was found to be associated with a 4% increase in likelihood of employment for individuals with disabilities [8]. In these studies, it was hypothesized that factors such as increased socialization, peer mentoring, and self-confidence from adaptive sports were most influential for likelihood to return to work rather than increased physical fitness. The social benefits cited in these studies can also arguably be seen in adaptive gaming participation. However, previous studies on the benefits of recreational activities on employment for individuals with disabilities have been focused on adaptive sports, and none have yet to investigate whether there are possible vocational benefits from participation in adaptive video gaming.

Employment rate among individuals with physical disabilities has been found to be much lower compared to the general population with employment rates estimated to be 26.6% in 2021 for those with an ambulatory disability [9] and approximately 35% for any employment after a spinal cord injury [10]. Multiple factors including level of education, severity of impairment or injury, and age

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## Relationship Between Employment and Adaptive Video Gaming in Individuals with Physical Disabilities

More frequent use of adaptive gaming equipment for work was associated with a higher likelihood of full-time employment. Most participants who were employed reported subjective benefits of adaptive gaming on employment through improvements in mental health, physical function, and cognition.

Redepenning, D. H., Bell, M., Adenaiye, O., & Dicianno, B. E. (2024). Relationship between employment and adaptive video gaming in individuals with physical disabilities. *Disability and Rehabilitation: Assistive Technology*.

## Conceptual Mapping Proposed to Comprehend the Effect of Wheelchair Mobility on Social Participation and Quality of Life: a Systematic Review

The provision of wheelchair (WC) according to the eight steps service proposed by the World Health Organisation contributed to higher levels of physical health, WC satisfaction, hours using the WC and QoL enhancement. Attention should be given to enhance WC service provision (with continuous service support) as well as professional continuing education.

Ferretti, E. C., Curi, H. T., Andrade, L. F., Cooper, R. A., & De Soárez, P. C. (2022). Conceptual Mapping Proposed to Comprehend the Effect of Wheelchair Mobility on Social Participation and Quality of Life: a Systematic Review. *Disability and Rehabilitation: Assistive Technology*.

DISABILITY AND REHABILITATION: ASSISTIVE TECHNOLOGY  
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REVIEW ARTICLE

Check for updates

Conceptual mapping proposed to comprehend the effect of wheelchair mobility on social participation and quality of life: a systematic review<sup>a</sup>

Elana Chaves Ferretti<sup>a</sup> , Haidar Tafner Curi<sup>b</sup> , Luana Foroni Andrade<sup>c</sup>, Rory A. Cooper<sup>d</sup> and Patricia Coelho de Soárez<sup>e</sup>

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ABSTRACT

**Purpose:** To identify and synthesise the available evidence on the effect of mobility on social participation and quality of life (QoL) of wheelchairs (WC) on adults who use WC as their primary means of mobility.

**Materials and methods:** Systematic review undertaken in accordance with the Centre for Reviews and Dissemination Guidelines and registered in the PROSPERO International Prospective Register of Systematic Reviews. Nine electronic databases (MEDLINE, PubMed, EMBASE, Cochrane Library, LILACS, CINAHL, PEDro, SCOPUS, Web of Science, and BIOSIS) were searched with the following PICOS eligibility criteria: (P) Population was individuals with mobility limitations that live in their community, aged 18 or older; (I) Intervention was mobility devices, such as manual and powered wheelchairs; (C) Comparators, not applied; (O) Outcome was factors that can be influenced by wheelchair use, such as social participation, health-related quality of life and QoL. Critical appraisal of methodological quality of studies were undertaken.

**Results:** A total of 18 studies were included. The proportion of studies evaluating the effects of mobility on participation was higher than to mobility on QoL. WC quality, device benefits (ease of repairs and maintenance), confidence using a WC and WC skills were key factors determining participation. The provision of WC according to the eight steps service proposed by the World Health Organisation contributed to higher levels of physical health, WC satisfaction, hours using the WC and QoL enhancement.

**Conclusions:** Attention should be given to enhance WC service provision (with continuous service support) as well as professional continuing education.

IMPLICATIONS FOR REHABILITATION

- Wheelchair technology is a key element in rehabilitation. Significant effort should be made to provide and maintain the wheelchair as a facilitator to participation. A great attention should be done to enhance wheelchair services as well as professional continuing education.
- Wheelchair skills are associated with participation and may be targeted in clinical intervention.

Introduction

The World Health Organisation (WHO) estimates that more than 70 million people need a wheelchair (WC) worldwide [1]. Even though access to proper and affordable WC has been designated by the United Nations Convention on the Rights of Persons with Disabilities, only 3–15% out of 75 million people who need a wheelchair have access to one [1]. A lack of access to suitable WC and services are significant barriers to human rights of personal mobility and could be considered discrimination against people with disabilities [1]. Personal mobility may enable an individual with mobility constraints to be more independent, to participate and to have opportunities to access education, employment, health care, and take part in family and community life [2,3].

The International Classification of Function, Disability, and Health (ICF) brought to light the concept of social participation. Social participation is used to refer to returning to the mainstream of family and community life, engaging in common roles and responsibilities, actively contributing to one's social groups and of society as a whole [4,5]. A wheelchair is an environmental factor that can be considered as either a facilitator or barrier to participation [3,4]. The provision of WC according to the eight steps service process proposed by the World Health Organisation encompasses a referral, a well-completed assessment, prescription, funding and ordering, product preparation, training, maintenance, repairs and follow-up essential to promote the use of the WC effectively and safely [2]. Appropriate provision of wheelchairs is essential for the successful rehabilitation of people who need a

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<sup>a</sup>Study was performed at Departamento de Medicina Preventiva, Faculdade de Medicina, Universidade de São Paulo, SP, Brazil.

<sup>b</sup>Supplemental data for this article can be accessed online at <https://doi.org/10.1080/17483107.2022.2126964>.

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## Bone Health in Individuals with Spinal Cord Injury

Principal Investigator: Adam Sterczala, PhD

**Purpose:** 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.

**Study Requirements:** For more information or to check eligibility, call 412-822-3685 and mention the Irisin SCI Study.

## Development and Evaluation of Powered Personal Transfer System (PPTS) for Wheelchair Users (Phase II)

Principal Investigator: Rory Cooper, PhD

**Purpose:** To collect feedback from caregivers and power wheelchair users on the PPTS transfer process and the new custom seating system.

**Study Requirements:** Caregivers will experience being transferred using the PPTS before testing how to transfer with the new system. Power wheelchair users will be transferred using the PPTS before navigating through a mobility course in a test wheelchair. No more than 20 minutes to complete.

## Design Improvements and Evaluation of a Knee Stress-Relief Powered Exoskeleton for Veterans with Knee Osteoarthritis

Principal Investigator: Dan Ding, PhD

**Purpose:** To compare the study's performance to a passive knee brace in people with osteoarthritis (OA).

**Study Requirements:** Participants will answer questions and perform tasks during two visits.

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# Recruiting Participants.

Sign up for our **Registry**



A research registry is a collection of individuals interested in learning about research studies that may be of interest to them. We are inviting you to join in the Human Engineering Research Laboratories (HERL) Assistive Technology Registry because you might be interested in participating in our current or future research studies.

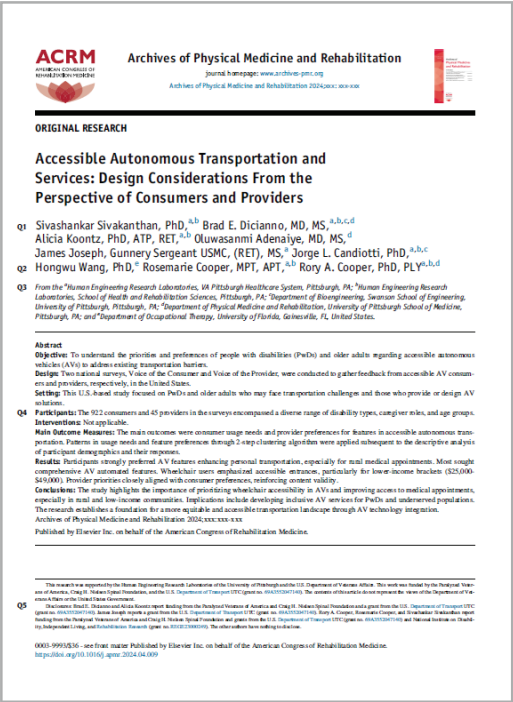
## Accessible Airline Transportation for Mobility Device Users: Survey

Principal Investigator: Rory Cooper, PhD



**Purpose:** To estimate pent-up demand among mobility device (MD) users to travel on commercial airlines and identify MD users’ needs and pain points.

**Study Requirements:** Complete a survey about your demographics and airline travel experiences. The survey is expected to take no more than 20 minutes to complete.



## Accessible Autonomous Transportation and Services: Design Considerations from the Perspective of Consumers and Providers

The study highlights the importance of prioritizing wheelchair accessibility in AVs and improving access to medical appointments, especially in rural and low-income communities. The research establishes a foundation for a more equitable and accessible transportation landscape through AV technology integration.

Sivashankar Sivakanthan, Brad E Dicianno, Alicia Koontz, Oluwasanmi Adenaiye, James Joseph Gunnery Sergeant, Jorge L Candiotti, Hongwu Wang, Rosemarie Cooper, Rory A Cooper (2024) Accessible Autonomous Transportation and Services. *Archives of Physical Medicine and Rehabilitation*.



## Development and Content Validity of the Caregiver Assisted Transfer Technique Instrument

The results of this study supported and improved the content validity of the CATT to evaluate assisted transfer technique, indicating that it may be a useful tool for assessment of informal caregivers. Future work will involve further establishing the basic psychometric properties of the CATT when assessing assisted wheelchair transfers.

Kulich, H. R., Collins, D., Dicianno, B. E., Leykum, L., Worobey, L., Cooper, R., & Koontz, A. M. (2024). Development and content validity of the caregiver assisted transfer technique instrument. *Assistive Technology*.



# Publications Manuscripts



## Effects of In-Wheel Suspension on Whole-Body Vibration and Comfort in Manual Wheelchair Users

Several surfaces in the environment have the potential to cause high levels of WBV to MWUs, with limited technology to reduce the effects of the environment. In-wheel suspension systems present a potential solution for reducing the WBV and are compatible with most wheelchair models on the market today.

Neti, A., Brunswick, A., Marsalko, L., Shearer, C., & Koontz, A. (2024). Effects of In-Wheel suspension on Whole-Body vibration and comfort in manual wheelchair users. *Vibration*.



## Understanding Travel Considerations and Barriers for People with Disabilities to Using Current Modes of Transportation Through Journey Mapping

Our study used a journey mapping methodology to investigate travel considerations and barriers for PWDs using private vehicles, public transportation, and paratransit/taxi/rideshare. Our findings make important contributions to the literature as we have demonstrated how journey mapping identified some of the barriers to travel when using various transportation systems, and the underlying reasons for those barriers.

Lee, C. D., Koontz, A. M., Cooper, R., Sivakanthan, S., Chernicoff, W., Brunswick, A., Deepak, N., Kulich, H. R., LaFerrier, J., Lopes, C. R., Collins, N. L., Dicianno, B. E., & Cooper, R. A. (2023). Understanding Travel Considerations and Barriers for People with Disabilities to Using Current Modes of Transportation Through Journey Mapping. *Transportation Research Record*.



## Swanson Virtual Newsroom

Smoothing Out the Bumps in the Road

May

New documentary reveals how Rory Cooper's life experience transformed revolutionary assistive technology. [Article about film screening hosted by Pitt Research]



## Pittsburgh Today Live

The Art of Handcycling

April

Katie O'Malley is learning the art of hand-cycling ahead of the Pittsburgh Marathon. Team PTL rolled with [Dr. Cooper] to show the Steel City a side of the Pittsburgh Marathon that you may not know about.





# In the News



## National Strategy for Inclusive Innovation - USPTO Report

May

Dr. Cooper featured in conversation about encouraging and supporting an inclusive workforce across public and private organizations - Elevate Diversity, Equity, Inclusion, and Accessibility as Central Organizational Values.



## Diversity in Action

Catching Up with Dr. Rory Cooper

May

From a White House Honor to a steady stream of cutting-edge developments in assistive technology, the life of Dr. Rory Cooper has been such a whirlwind of accomplishments since his last *Diversity in Action* appearance in the November/December 2021 issue that even he is amazed.



## Pitt Innovation Institute

University of Pittsburgh Announces Pitt Innovators Issued 6 Patents in April

May

Featured patent: 11,944,426: "Axial Load Cell". Pitt researchers at the Human Engineering Research Laboratories within the School of Health and Rehabilitation Sciences have developed a system of axial load cells that can be integrated into a bed to measure weight in a home setting.

# By the Numbers

SO FAR THIS YEAR, HERL HAS BEEN AWARDED, DISSEMINATED, AND ENGAGED WITH...

- 6 prestigious personal and organization awards
- 10 manuscripts in respected, peer-reviewed journals, 4 more accepted
- 2 patents from the USPTO
- 13 lectures and visits from distinguished peers and organizations
- 1 research web portal. *RERC - Move It*
- \$75M+ in grant proposals and funding

HERL HAS ALSO PRESENTED LECTURES AND RESEARCH ACROSS...

- 2 continents
- 5 American states + the District of Columbia

# Rumination of the Quarter

"Working at HERL has been incredibly rewarding. Being able to be a part of this dynamic, collaborative environment, all while engaging in innovative projects makes every day exciting and fulfilling."

- Iyan Nekib  
Student Researcher



Celebrating our best moments and achievements from the past three months.

**D**irector **Dr. Rory Cooper** presented the Duane Norman Lecture at UC San Diego, and attended the Celebration Gala for him and his fellow National Medal Laureates in Washington D.C. in April. In May, he was a keynote speaker at Texas A&M's School of Engineering's first annual *Research Day*, and participated in the Pittsburgh Marathon, alongside the H-Cat team - **Benjamin Gebrowski, Josh Marino, Dr. Jorge Candiotti**, and co, and the Rush to Crush Cancer.

Medical Director & COO **Dr. Brad Dicianno** co-wrote and released the Summer 2024 UPMC Adult Spina Bifida Clinic newsletter, and oversaw the Assist+ Open House at the UPMC Mercy Pavilion. In the past three months, he participated in a wide variety of professional and community activities including the Easterseals Walk With Me event at Kennywood with **William Schoy** and **Dr. Breelyn Styler**.

Assitant Director for Data Science **Dr. Gina McKernan** led HERL's work on the *Commuting in America* issue brief section published on by the American Association of State Highway and Transportation Officials.

Graduate researcher **Shantanu Satpute** earned a winning spot in the *RESNA Student Scientific Paper Competition*. **Dr. Ahlad Neti's** RESNA submission was selected as one of the runners-up.

HERL alum **Dr. Padmaja Kankipati** officially accepted the WHO Technical Officer- AT position in the Georgia country office in Tbilisi, Georgia.

**Drs. Jongbae Kim** (Yonsei University), **Florence Haseltine** (UT Arlington), **Vicky Tolfrey** (Loughborough University), **Thomas Rietveld** (Loughborough University), and **Erica Gavel** (Ontario Tech) presented lectures at HERL.

Our staff and faculty presented their research at multiple events across the country, including the *Pittsburgh Adaptive Recreation Expo*, the *Buckeye Wheelchair Games*, the *Postdoc Symposium*, the *National Disabled Veterans' Winter Sports Clinic*, and this year's *VA Research Week* in May. HERL representatives at these events included **Drs. Sivashankar Sivakanthan, Sangmi Park, Jorge Candiotti, and Breelyn Styler.**

The Labs also hosted a variety of tours in the 2nd Quarter of 2024. These included visits from the **Shadyside Academy**, **VA Simulation Center**, the **Young Southeast Asian Leaders Initiative** (YSEALI), and the **Marine Wounded Warrior Regiment – Battalion West**.

HERL's RERC team oversaw the launch of the *RERC - Move It Research Center* website, along with **Drs. Brandon Pitts** and **Brad Duerstock** (Purdue University). [[rerc-move-it.pitt.edu](http://rerc-move-it.pitt.edu)]

HERL organized and participated in the 20th annual **State of the Science Symposium** at the Henry M. Jackson Foundation for the Advancement of Military Medicine in May. Interns from the **Research Experience** program began their journey with us the same month.

The long-anticipated screening of *Bumps in Road* hosted by Pitt Research in May was a major success, with appearances by Pitt Senior Vice Chancellor for Research **Rob A. Rutenbar**, author **Anthony Swofford**, and the film's creators **Alex Halpern** and **Rachel Kittner**.

PHOTO GALLERY (LEFT TO RIGHT, TOP TO BOTTOM):

Garrett Grindle and Ben Gebrowski (left) with the Marine Wounded Warrior Regiment - Battalion West.<sup>1</sup> Jorge Candiotti, Wei Deng, William Schoy, Adam Sterczala, Prithvi Das, and Nikitha Deepak at the Buckeye Games.<sup>2</sup> Josh Marino giving a tour.<sup>3</sup> Mini-symposium lecturers with REU interns in the background.<sup>4</sup> Gavin, Danielle Scott, Minoru Izuka, Andrew Gryskewicz, Michael Da Silva, Iyan Kekib and Shantanu Satpute looking at the solar eclipse.<sup>5</sup> Ahlad Neti giving a presentation.<sup>6</sup> Sivashankar Sivakanthan<sup>7</sup> and Sangmi Park<sup>8</sup> presenting research. Garret Grindle<sup>9</sup> and Minoru Izuka<sup>10</sup> leading tours. HERL group photo with Jonbae Kim (center).<sup>11</sup> Alex Halpern signs a film poster with Dr. Cooper.<sup>12</sup> Brad Dicianno, William Schoy, and Breelyn Styler at Walk With Me.<sup>13</sup> Rosi Cooper, Breelyn Styler, Ben Gebroski, and Rory Cooper at the Rush to Crush Cancer.<sup>14</sup> The HCAT team at the Pittsburgh Marathon.<sup>15</sup>