

ASB Annual Meeting

AUGUST 8 – 11 2023 Knoxville Convention Centre Knoxville, TN

www.asbweb.org

Program at a Glance

Time	August 8, 2023	August 9, 2023	August 10, 2023	August 11, 2023
	Tuesday	Wednesday	Thursday	Friday
7:00				
7:15		Continental Breakfast & Registration	Continental Breakfast & Registration	6:30-7:30 5km Fun Run
7:30				Continental Breakfast & Registration
8:00		Opening Remarks (8:00-8:15)	Announcements (8:00-8:15)	Announcements (8:00-8:15)
8:15		Keynote#1: Catherine Kuo	Keynote #2: Cynthia Reinhart-King	Borelli Award
8:30				
9:00				
9:15		Transition	Transition	Transition
9:30				
9:45	Workshops/Tutorials	Session Block 1: 4 x Concurrent + Thematic	Session Block 4: 4 x Concurrent + Thematic	Session Block 7: 4 x Concurrent + Thematic
10:15		(9:30-11:00)	(9:30- 11:00)	(9:30-11:00)
10:30				
10:45		Coffee Breek at Vender Sykikite	Coffee Dreek at Vender Fukikite	Coffee Breek at Vander Erkikite
11:00		(11:00 - 11:30)	(11:00-11:30)	(11:00-11:30)
11:30				
11:45		Session Block 2: 4 x Concurrent + Thematic	Session Block 5: 4 x Concurrent + Thematic	Session Block 8: 4 x Concurrent + Thematic
12:00		(11:30-13:00)	(11:30-13:00)	(11:30-13:00)
12:30	Lunch on Own			
12:45				
13:00		Lunch at Vendor Exhibits	Lunch at Vendor Exhibits	Lunch at Vendor Exhibits
13:30		Wentoring Event	Diversity Event	Asb business meeting & closing ceremony
13:45				
14:00				
14:15				
14:45	Workshops/Tutorials	Award Lectures: Pre-Doc, Early Career, JRFA, Up-	Session Block 6: 4 × Concurrent + Thematic	
15:00		and-Comer	(14:30-16:00)	
15:15		(14:30-15:45)		
15:45		Transition		
16:00				
16:15		Session Block 3: 4 x Concurrent + Thematic		
16:45		(16:00-17:30)	Poster Session 2 & Exhibitors	
17:00			(16:00-18:00)	
17:15				
17:30				
18:00				
18:15	Oracina Reception	Poster Session 1 & Exhibitors		Free Time
18:30 18:45	(Knoxville Convention Center)	(17:30-19:30)	Room	
19:00	· · · · · · · · · · · · · · · · · · ·			
19:15				
19:30				
20:00		Women in Science Event		
20:15		(19:30-21:00)		
20:30				
21:00			Conference Banquet	
21:15			(20:00-22:00)	
21:30		Free Time		
21:45				
22.00				

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Welcome

WELCOME TO THE 47TH ANNUAL MEETING OF THE **AMERICAN SOCIETY OF BIOMECHANICS (ASB)!**



As my role of President comes to an end, leaving the ASB in the great hands of Dr. Sara Myers, I would first like to highlight the very fulfilling experience of serving on the ASB Executive Board. While it is certainly rewarding from a career advancement perspective, more personally, I feel honored and humbled serving with an incredibly dedicated group of individuals who deeply care about our society and community. Also, the number of ASB

member volunteers who serve on committees, review abstracts, etc. makes be proud to be a member of our Society. Thank you, all! For those of you that have been a little hesitant to be engaged, please do not hesitate! I encourage all students, trainees and researchers with primary interests in biomechanics to make ASB their home scientific society (spread the word!), to stay engaged, to participate in ASB's activities and to propose initiatives that would further serve our community. I would like also to re-iterate that I know I am slightly biased, but that is okay: ASB is a great society to be affiliated with.

Now back to the annual meeting, the Executive Board is excited and grateful that you decided to join us at this year's ASB Annual Meeting in Knoxville, Tennessee. You will enjoy a scientifically invigorating program, opportunities for professional development, diversity-related activities and fun social events. A top priority of the ASB Annual Meeting is the career advancement of the next generation of biomechanists, all in one of the friendliest, warmest and fun environments that I have ever experienced at national meetings.

This year's ASB annual meeting could not have happened without the extensive planning and organizing efforts of our ASB Meeting Chair, Dr. Jeffrey Reinbolt, as well as our tireless ASB Program Chair, Dr. Ross Miller. Drs. Reinbolt, Miller and their committee members spent months of their lives this past year addressing unanticipated challenges related to the planning of the first individual ASB annual meeting held after the pandemic. I would also like to thank ASB's Diversity Chair, Dr. Ajit Chaudhari, who made sure the ASB Annual Meeting remains a diverse, equitable and inclusive event, fully



engaging various ASB affinity groups in the Annual Meeting. My appreciation goes to our ASB Student Representative, Anna Bailes, who worked hard to plan events that are attractive to students. Thank you to all other members of the ASB Executive Board, who assisted in the planning of specific programs. Special sincere thanks to our corporate partners who support our Society and made so many events at the Annual Meeting possible because of their generous support. Finally, I am personally grateful for the assistance provided by Podium Conference and Association Specialists for helping with the operation of the Society in general and more specifically with the planning of the ASB Annual Meeting, particularly Ms. Cendrine De Vis, Ms. Michelle Smith and Mr. Marischal De Armond.

Once again, on behalf of the ASB Executive Board, I thank you for attending the ASB Annual Meeting in Knoxville and encourage you to fully take advantage of this wonderful event, both professionally and personally by reconnecting with old friends and making new ones!

Rakié Cham, PhD President, American Society of Biomechanics Professor, University of Pittsburgh

Society Information

AMERICAN SOCIETY OF BIOMECHANICS

The American Society of Biomechanics (ASB) was founded in 1977 to encourage and foster the exchange of information and ideas among biomechanists working in different disciplines and to facilitate the development of biomechanics as a basic and applied science.

ASB has a membership of more than 1,000w academic researchers, clinicians, scientists, students, and industry members working to solve basic and applied problems in the realm of biomechanics and to improve understanding of the workings of biological systems. ASB members are organized into five primary discipline categories: biological sciences, exercise and sports science, health sciences, ergonomics and human factors, and engineering and applied science.

LEADERSHIP

Rakié Cham, PH.D., President, University of Pittsburgh

Sara Myers, PH.D., President-Elect, University of Nebraska at Omaha

Elizabeth Hsiao-Wecksler, PH.D., Past President, University of Illinois at Urbana-Champaign

Maria Pasquale, MS, Treasurer, Novel Electronics Inc

Ana Ebrahimi, PH.D., Secretary, National Institutes of Health

Allison Altman-Singles, PH.D., Education Chair, Pennsylvania State University Berks

Srikant Vallabhajosula, PH.D., Communications Chair, Elon University

Cara Lewis, PH.D., Newsletter Editor, Boston University

Ross Miller, PH.D., Program Chair, University of Maryland James Finley, PH.D., Program Chair-Elect, University of Southern California

Jeffrey Reinbolt, *PH.D.*, *Meeting Chair, The University of Tennessee*

Ajit Chaudhari, PH.D., Diversity Chair, The Ohio State University

David B. Lipps, PH.D., Awards Chair, University of Michigan

Anna Bailes, PT, DPT, Student Rep, University of Pittsburgh



asbweb.org



WHAT DOES THE ASB OFFER TO STUDENTS

In addition to having an elected Executive Board position for a student representative, ASB provides several venues for student engagement in Society initiatives and student participation at the Annual Meeting.

ENGAGEMENT IN SOCIETY INITIATIVES

Over the last few years, the Student Committee has initiated and organized initiatives dedicated to students and early career researchers.

1. Ask-Me-Anything (AMA) Series Student Author AMA Series is a series of online events by and for students. The AMA series features students that have recently published a paper talking to other students about their research and sharing their experience with the publishing process.

The Student Committee has organized 8 events in the last 12 months. Participation is free. Recordings of past events are available on the website (*asbweb.org/student-author-ama-series*)

- 2. Professional Development Series. Started in the Fall of 2022, the novel Professional Development online events are geared toward students' professional development. This series of workshops features students, post-docs, faculty, and industry partners who will discuss topics chosen by the ASB Student Committee. Topics will include navigating career choices post-graduation, managing work/life balance, and finding/applying for funding opportunities. Participation is free. Recording of past events are available on the website (*asbweb.org/ professional-development-series*)
- 3. Student Chapters The ASB Student Body provides comprehensive intellectual and professional development among students. Networking, collaboration, and discourse throughout the ASB Student Body is essential to the long-term growth of the society as a whole, as future industry and academic leaders will arise from today's students. There are 14 active Student Chapters at universities around the country, and the Student Committee provides excellent support for students who wish to form their own Student Chapter.

The Diversity Committee and Affinity Groups have also created several initiatives outside of the Annual Meeting to support students from disadvantaged backgrounds. These are open to all members, and many events are open to anyone regardless of ASB membership.

- 4. Biomechanics Summer Undergraduate Research Experience (B-SURE): This program offers scholarship support to students from disadvantaged backgrounds to pursue research mentored by an ASB member. It is intended to remove the barriers associated with financial need and a lack of a professional network.
- 5. Black Biomechanists Association: BBA offers community outreach, professional programming, supportive mentoring, and other programming to support Black Biomechanists and Allies throughout the year.
- 6. International Women in Biomechanics: IWB hosts monthly teleconference meetings and workshops aimed to provide resources and professional training to the IWB community.
- 7. Latinx in Biomechanix: LiB provides networking opportunities and uplifts its members' accomplishments to support Latinx Biomechanists and Allies.
- 8. The Biomechanics Initiative: TBI leads National Biomechanics Day events worldwide, focusing and leveraging our outreach efforts to grow Biomechanics especially in under-served communities.

PARTICIPATION IN THE ANNUAL MEETING

While the specific student activities may vary from year to year, here are some typical student-focused activities that the ASB offers:

 Student travel awards: The ASB offers complimentary registration (value \$300) to help students cover the costs associated

with attending the Annual Meeting. These awards are typically competitive. In 2023, the application was simplified by integrating the application with the submission process. For the 2023 Annual Meeting, the ASB is supporting 25 students.

- 2. Diversity travel awards: The ASB offers complimentary registration (value \$300) to help individuals from historically excluded and marginalized groups to attend the Annual Meeting. These awards are also competitive. For the 2023 Annual Meeting, the ASB is supporting 18 individuals (16 students, 2 post-docs).
- 3. Student volunteer opportunities: the ASB often seeks student volunteers to assist with various tasks during the Annual Meeting. In exchange for their time and effort, volunteers receive a complimentary registration. For the 2023 Annual Meeting, the ASB is supporting 10 students.
- 4. Student-specific sessions: The ASB organizes sessions and workshops specifically tailored to students' needs and interests. These sessions can provide valuable networking opportunities, career guidance, and educational content designed to support student development in the field of biomechanics.
- 5. Mentoring program: The ASB Student Committee organizes the one-on-one mentoring program that matches students with faculty for mentoring at the meeting and afterwards. This program includes a dedicated lunch for program participants to meet.
- 6. Diversity event & Women In Science event: The ASB Diversity Committee organizes a lunch meeting every year focused on equity & inclusion for people from marginalized groups, and an evening event focused on equity & inclusion for female & non-binary individuals and their allies. These events provide networking and capacity building opportunities for all attendees. In 2023 the topic of discussion at the Diversity Lunch is citation bias, and the topic of discussion at the Women In Science Event is the Likeability Trap.

- 7. Workshops: The ASB offers many workshops at the Annual Meeting every year, and several are focused on issues disproportionately affecting members from marginalized groups, teachingintensive institutions and others who don't have the resources, network, and institutional knowledge that the largest research-intensive institutions have.
- Affinity group meetings: The ASB welcomes affinity groups to the Annual Meeting as a venue to cultivate cohort and community building. See the meetings scheduled for the 2023 Meeting at *asbweb.org/affinity-groups/*
- Networking opportunities: The ASB organizes several social events designed to facilitate networking among students as well as with professionals.
 - Student Social / Night Out: A casual, fun event designed for students to network with Student Committee members, Student Chapter representatives and fellow students.
 - Student Welcome Event: Often held after the Opening Reception, another fun event for student networking.
 - Job Market Poster Session (a more recent addition to the program). In this novel session, delegates searching for biomechanics jobs in the upcoming year will present posters that introduce themselves, their background/skills/research/etc. (essentially a "job talk" in poster form), to people at institutions who will be searching/hiring in biomechanics in the upcoming year.
- 10.Student room sharing: The ASB facilitates a process by which delegates can share hotel rooms and accommodation costs.
- 11. Student presentation award: The ASB recognizes outstanding student poster presentations at the Annual Meeting with the President's Award.

CODE OF CONDUCT

Membership in professional societies, including the American Society of Biomechanics (ASB), has implied expectations for ethical behavior in research, teaching, and service to all segments of society.

All members of and/or participants in ASB events shall:

- Honor and respect the field of biomechanics by conducting oneself responsibly, ethically, and lawfully.
- Participate in respectful scientific debate.
- Hold paramount the safety, health, and welfare of the public.
- Provide truthful, accurate, relevant, and evidence-based information based upon competence in the subject matter and knowledge of the facts and disseminate without deception.
- Abide by the basic principles of respect of persons, beneficence, and justice and comply with regulations in accordance with each person's institutional review board.
- Endeavor to increase the knowledge in the discipline and within reasonable limits of time and finance, shall make available that knowledge, skill, and training to the public for the benefit of all.
- Disclose any conflicts of interest and review the professional work of others fairly and in confidence.
- Recognize the contributions of others and not associate or allow the use of their name on enterprise known to be illegal, fraudulent or of questionable character.
- Participate in activities contributing to the improvement of the biomechanics community.

The ASB is committed to fostering open dialogue and the exchange of scientific ideas, with mutual trust based upon honesty, integrity, and respect for all persons. It is the policy of the ASB that all participants attending both in-person and virtual ASB-sponsored activities (videoconference attendees or social media contributors) including attendees, vendors, ASB representatives, volunteers, and all other stakeholders will conduct themselves in a professional manner that is welcoming to all and free from any form of discrimination, intimidation, harassment, or retaliation. Creating a supportive environment to enable discourse is the responsibility of all members and all participants at ASB activities.

Inappropriate actions, statements, or conduct based on individual characteristics such as age, religion, race, ethnicity, sexual orientation, gender identity, gender expression, marital status, nationality, political affiliation, ability status, educational background, or any other personal characteristic, or other disruptive or harassing behavior of any kind will not be tolerated. The ASB has a reporting system with both anonymous and non-anonymous option. All reports will be investigated and sanctions up to and including expulsion from the ASB may be imposed, as detailed in the Investigations Policy.

If a crime is being committed or you fear for your immediate safety, please contact the local authorities or 9-1-1.

All members and participants at ASB activities are expected to be familiar with and positively accept the full ASB Code of Conduct as a condition of participation.

VENUE

Knoxville Convention Centre

701 Henley Street, Knoxville, TN 37902

All scientific conference sessions will take place in this location.



WIFI ACCESS

Complimentary wireless internet is available to the delegates of the ASB Meeting throughout the Conference Center and facilities. Please note the complimentary Wi-Fi is ideal for checking emails and websites but is not strong enough for streaming videos or heavy social media use.

REGISTRATION

REGISTRATION FOR ASB 2023 INCLUDES:

Four full days of robust, peer reviewed scientific content including keynote speakers, awards sessions, workshops, symposia sessions, individual orals, and dedicated poster sessions, as well as professional development opportunities.

- On-site welcome reception with food and drinks
- Daily lunches and coffee breaks
- Two poster sessions
- Complimentary WIFI in the conference space
- Digital program and conference app
- Complimentary access to pre-conference workshops
- The opportunity to network with colleagues, collaborators, and others in the biomechanics community.



NAME BADGES

Your name badge is your admission ticket to the preconference workshops, conference sessions, coffee breaks, lunches, and receptions. Please always wear it. At the end of the conference, we ask that you recycle your name badge in one of the name badge recycling stations that will be set out or leave it at the registration desk.

LOST NAME BADGES

There is a \$25 replacement fee for any lost or missing name badges – If you've lost your name badge, visit the registration desk for a replacement as soon as possible.

REGISTRATION AND INFORMATION DESK HOURS

The ASB registration and information desk, located in the Main Concourse will be open during the following dates and times:

Tuesday, August 8	7:00 – 17:00
Wednesday, August 9	7:30 – 19:30
Thursday, August 10	7:30 – 19:30
Friday, August 11	8:00 - 13:00

If you need assistance during the conference, please visit the registration desk.

POSTER INFORMATION:

SET-UP / REMOVAL

POSTER SESSION 1 – WEDNESDAY, AUGUST 9

Set Up: Between	7:30 – 17:00
Session Time:	17:30 – 19:30
Tear Down:	Please tear down directly
	after the session.

POSTER SESSION 2 – THURSDAY, AUGUST 10

Set Up: Between	7:30 – 15:30
Session Time:	16:00 - 18:00
Tear Down:	Please tear down directly
	after the session.

STAFF

ASB staff from Podium Conference Specialists can be identified by bright orange 'STAFF' ribbons on their name badges. Feel free to ask anyone of our staff for assistance. For immediate assistance please visit us at the registration desk.

MEALS

Two daily coffee breaks and lunches are provided August 9-10, and one coffee break and lunch on August 11 for all registrants. All other meals are on own. Please view the full program for times.

DIETARY REQUIREMENTS

If you noted a dietary requirement when registering it will be noted on the back of your name badge. All lunches are grab and go lunch boxes. If your dietary need is specific, there will be a box with your name on it. If you are vegetarian, gluten or dairy free, that will be noted on the boxed lunch.

CONFERENCE APP

Download the conference app, **AmSocBio23**, for the most current program information, abstracts, and the opportunity to network with other delegates. Create your own schedule, review talks, and even make plans for the evenings.

Scan the QR code below to load **AmSocBio23** on your devices!



Daily Program

TUESDAY, AUGUST 8

All day	In front of Rotunda	REGISTRATION DESK (hours 7:00-17:00)
All day	Board Room	SPEAKER READY ROOM
All day	200 DE	PARTICIPANT RESEARCH STUDY
8:00-12:00	301 ABC	WS1: Developing Engaged Teaching Strategies In Biomechanics
8:00-12:00	300 CD	WS2: Stroke Grand Challenge Competition And Nmsm Pipeline Training Workshop
8:00-12:00	301 DE	WS3: Basic Fractal Analysis In Movement Science
12:00-13:00		LUNCH ON OWN
13:00-17:00	300 CD	WS4: Creating The Future Of Biomechanics Through Comprehensive Admissions Practices
13:00-15:00	301 DE	WS5: Federal Funding For Biomechanics Research
13:00-15:00	301 ABC	WS6: Enabling Large-Scale Biomechanics Studies And Data Sharing Using Opencap And Addbiomechanics
16:00-18:00	301 ABC	WS7: Writing A Successful Nih R01 Proposal
17:30-18:00	Rotunda Room	STUDENT WELCOME
18:00-19:30	Concourse	OPENING RECEPTION
19:00-20:00	Off-site	IWB SOCIAL HOUR
20:00-22:00	Off-site	STUDENT NIGHT OUT

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WEDNESDAY, AUGUST 9

All day	In front of Rotunda	REGISTRATION DESK (hours 7:30-19:30)
All day	Board Room	SPEAKER READY ROOM
All day	200 DE	PARTICIPANT RESEARCH STUDY
7:00-8:00	Ballroom DEFG	CONTINENTAL BREAKFAST
8:00-8:15	Ballroom ABC	OPENING REMARKS
8:15-9:15	Ballroom ABC	KEYNOTE: Catherine Kuo
9:30-11:00	Ballroom ABC	PODIUM: Running Injury
9:30-11:00	301 ABC	PODIUM: Clinical Movement Disorders
9:30-11:00	301 DE	PODIUM: "Real World" Biomechanics
9:30-11:00	300 CD	PODIUM: Education and Outreach
9:30-11:00	300 AB	THEMATIC: Comparative and Animal Biomechanics
11:00-11:30	Ballroom DEFG	COFFEE BREAK
11:30-13:00	Ballroom ABC	AWARDS: Goel, Pytel, and Founders
11:30-13:00	301 ABC	PODIUM: Stroke Rehabilitation and Gait
11:30-13:00	301 DE	PODIUM: Skeletal Muscle Mechanics
11:30-13:00	300 CD	PODIUM: Shoulder Health
11:30-13:00	300 AB	THEMATIC: Validity of Markerless Motion Capture
13:00-14:30	Ballroom DEFG	BOXED LUNCH
13:00-14:30	200 ABC	MENTORING EVENT
13:00-14:30	301 DE	ASB STUDENT CHAPTER MEETING
13:30-14:30	300 DE	MENTAL HEALTH BREAK (sponsored by BBA & LiB)
14:30-15:45	Ballroom ABC	AWARD LECTURES



WEDNESDAY, AUGUST 9

DAILY PROGRAM THURSDAY, AUGUST 10

16:00-17:30	Ballroom ABC	SYMPOSIUM: Introduction to an Open-Source Approach to Bi-Plane Videoradiography and Multi-Modal Kinematic Tracking
16:00-17:30	301 ABC	PODIUM: Optimal Control Simulation
16:00-17:30	301 DE	PODIUM: Tendon Adaptation and Interaction
16:00-17:30	300 CD	PODIUM: Exoskeletons for Ergonomics
16:00-17:30	300 AB	THEMATIC: Balance in Gait
17:30-19:30	Ballroom DEFG	REGULAR POSTER SESSION #1 & EXHIBITORS
19:30-21:00	200 ABC	WOMEN IN SCIENCE EVENT

THURSDAY, AUGUST 10

All day	In front of Rotunda	REGISTRATION DESK (hours 7:30-19:30)
All day	Board Room	SPEAKER READY ROOM
All day	200 DE	PARTICIPANT RESEARCH STUDY
7:00-8:00	Ballroom DEFG	CONTINENTAL BREAKFAST
7:00-8:00	200 ABC	ASB FELLOWS BREAKFAST
8:00-8:15	Ballroom ABC	DAY 2 ANNOUNCEMENTS
8:15-9:15	Ballroom ABC	KEYNOTE: Cynthia Reinhart-King
9:30-11:00	Ballroom ABC	AWARDS: Journal of Biomechanics and Clinical Biomechanics
9:30-11:00	301 ABC	SYMPOSIUM: Turning towards real-world maneuvers to inform movement training paradigms
9:30-11:00	301 DE	PODIUM: ACL reconstruction and osteoarthritis
9:30-11:00	300 CD	PODIUM: Locomotion Energetics
9:30-11:00	300 AB	THEMATIC: Mobility with Lower Limb Exoskeletons



THURSDAY, AUGUST 10

11:00-11:30	Ballroom DEFG	COFFEE BREAK
11:30-13:00	Ballroom ABC	SYMPOSIUM: How to Get Involved with Biomechanics Education Research
11:30-13:00	301 ABC	PODIUM: Assistive Technology
11:30-13:00	301 DE	PODIUM: Spine and Lower Back
11:30-13:00	300 CD	PODIUM: Imaging for Bone and Joint Health
11:30-13:00	300 AB	THEMATIC: Aging and Mobility
13:00-14:30	Ballroom DEFG	BOXED LUNCH
13:00-14:30	200 ABC	DIVERSITY EVENT
13:00-14:00	301 DE	CHRISTIAN BIOMECHANICS FELLOWSHIP
13:00-14:30	Rotunda Room	MEETING OF THE JOURNAL OF BIOMECHANICS EDITORIAL BOARD
14:30-16:00	Ballroom ABC	AWARDS: Hay
14:30-16:00	301 ABC	PODIUM: Balance and Falls
14:30-16:00	301 DE	PODIUM: Women's Health
14:30-16:00	300 CD	PODIUM: Ankle Muscles and Pushoff
14:30-16:00	300 AB	THEMATIC: Lower Limb Loss and Prostheses
16:00-18:00	Ballroom DEFG	REGULAR POSTER SESSION #2 & EXHIBITORS
18:00-19:30	300 AB	JOB MARKET POSTER SESSION
18:00-19:30	301 DE	TEACHING BIOMECHANICS IN THE "NEW NORMAL"
18:00-19:30	301 ABC	EARLY CAREER AFFINITY GROUP
18:00-19:30	200 ABC	PROFESSIONAL ROUNDTABLE EVENT
20:00-22:00	Ballroom ABC	CONFERENCE BANQUET



12

FRIDAY, AUGUST 11

Half-day	In front of Rotunda	REGISTRATION DESK (hours 8:00-13:00)
Half-day	Board Room	SPEAKER READY ROOM
Half-day	200 DE	PARTICIPANT RESEARCH STUDY
6:30-7:30	Off-site	5KM FUN RUN
7:00-8:00	Ballroom DEFG	CONTINENTAL BREAKFAST
8:00-8:15	Ballroom ABC	DAY 3 ANNOUNCEMENTS
8:15-9:15	Ballroom ABC	BORELLI AWARD
9:30-11:00	Ballroom ABC	SYMPOSIUM: Biomechanics Research and Development Outside of Academia
9:30-11:00	301 ABC	PODIUM: Foot and Footwear
9:30-11:00	301 DE	PODIUM: Ergonomics and Human Factors
9:30-11:00	300 CD	PODIUM: Sports and Athletes
9:30-11:00	300 AB	THEMATIC: Landing and ACL Injury
11:00-11:30	Ballroom DEFG	COFFEE BREAK
11:30-13:00	Ballroom ABC	PODIUM: Osseointegrated Prostheses
11:30-13:00	301 ABC	PODIUM: Head Impact and Injury
11:30-13:00	301 DE	PODIUM: Hip Mechanics, Dysplasia, and Pain
11:30-13:00	300 CD	THREE-MINUTE THESIS
11:30-13:00	300 AB	THEMATIC: Running Performance
13:00-14:30	Ballroom DEFG	BOXED LUNCH
13:00-14:30	Ballroom DEFG	ASB BUSINESS MEETING & CLOSING CEREMONY

Updated June 30 - Subject to change

Keynote Speakers



BORELLI AWARD TALK AUGUST 11TH, 8:15AM - 9:15AM

ELLEN M ARRUDA UNIVERSITY OF MICHIGAN

Professor Ellen M Arruda is the Tim Manganello / BorgWarner Department Chair and Maria Comninou Collegiate Professor of Mechanical Engineering at the University of Michigan. She also holds appointments in Biomedical Engineering and in Macromolecular Science and Engineering. Professor Arruda earned her B.S. degree in Engineering Science and her M.S. degree

in Engineering Mechanics from The Pennsylvania State University, and her Ph.D. degree in Mechanical Engineering from the Massachusetts Institute of Technology.

Under her leadership the Mechanical Engineering department earned the Inaugural MEDHEC Diversity, Equity, and Inclusion Award from the American Society of Mechanical Engineers in 2022 and the Rhetaugh G. Dumas Progress in Diversifying Award, from the University of Michigan, also in 2022. Recent recognition for her teaching, research, and service contributions to engineering include the 2021 Eringen medal from the Society of Engineering Science, the 2019 Nadai medal from the American Society of Mechanical Engineers, the 2018 Rice medal from the Society of Engineering Science, the 2015 Outstanding Engineering Alumnus Award from the Pennsylvania State University, the 2014 Distinguished Faculty Achievement Award from the University of Michigan, and the 2014 Trudy Huebner Service Excellence Award from the College of Engineering, University of Michigan.

Professor Arruda teaches and conducts research in the areas of theoretical and experimental mechanics of macromolecular materials, including polymers, elastomers, composites, soft tissues and proteins, and in tissue engineering of soft tissues and tissue interfaces. Her research programs include experimental characterization and analytical and computational modeling of soft materials, including native and engineered tissues. She has pioneered a novel inverse method to characterize the non-linear, anisotropic response of soft tissues such as the anterior cruciate ligament and the supraspinatus tendon.

Professor Arruda has over 100 papers in scientific journals with 15,000 citations. Her H-index is 47 (Google Scholar). Professor Arruda is a Fellow of the American Society of Mechanical Engineers, the American Academy of Mechanics, the Society of Engineering Science, and the American Institute for Medical and Biological Engineering. She is currently President of the American Academy of Mechanics. She is a member of the National Academy of Engineering (class of 2017).





PRESENTING AUGUST 9TH, 8:15AM - 9:15AM

CATHERINE K KUO FISCHELL DEPARTMENT OF BIOENGINEERING, UNIVERSITY OF MARYLAND, COLLEGE PARK

Catherine K. Kuo is an Associate Professor in the Fischell Department of Bioengineering and in the Department of Orthopaedics and holds appointments in the Institute for Physical Science and Technology and Fischell Institute for Biomedical Devices at the University of Maryland. Her laboratory

focuses on tendon tissue engineering and regenerative medicine strategies informed by the mechanobiology of embryonic tendon development. She serves as an elected Council Member for the Tissue Engineering and Regenerative Medicine International Society-Americas (TERMIS-AM) and on the Advisory Council for the International Society of Ligaments and Tendons. She is a founding officer of the Tendon Section of the Orthopaedic Research Society (ORS), for which she served as Research Chair from 2017-2020. She is an elected Fellow of the American Institute for Medical and Biological Engineering (AIMBE, 2019), and was recipient of the Sweden GoLife Innovation in Research Award (2015), Emerging Investigator Award by Stem Cell Research and Therapy (2015), an NSF CAREER Award (2013), and March of Dimes Basil O'Connor Starter Scholar Research Award (2011). She is a two-time recipient of the University of Maryland Bioengineering Faculty Instructional Impact Award (2021, 2022) based on student nominations for excellence in teaching. She is also Editor-in-Chief of the Journal of Tissue Engineering and Regenerative Medicine. She has a B.S.E. in Materials Science and Engineering and Ph.D. in Biomaterials and Macromolecular Science and Engineering from the University of Michigan. She completed her postdoctoral studies at the National Institutes of Health (NIH) in the Cartilage Biology and Orthopaedics Branch of the National Institute of Arthritis and Musculoskeletal and Skin Diseases.

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Inspiring Tendon Therapeutic Strategies with Developmental Mechanobiology

Abstract: Tendons are highly collagenous connective tissues that transfer forces from muscles to bones to enable skeletal movement and stability. To perform their physically demanding roles, tendons must possess robust, tissue-specific mechanical properties. At the same time, tendons are responsive to their mechanical microenvironment and require physical cues to maintain normal health and function. Unfortunately, tendon mechanical properties are significantly compromised with adult tendon injuries, tendon-related birth defects, and connective tissue disorders. Each of these conditions poses significant clinical challenges because tendons lack the ability to regenerate, and there are no treatments to restore native tendon mechanical properties. The long-term goal of the Kuo Lab is to discover key mechanobiological mechanisms of natural tendon development and use this knowledge to inform adult and fetal tendon regenerative medicine strategies. We are focused on how mechanical cues (e.g., movement, stiffness) critically regulate tendon development in the embryo/fetus. This talk will introduce novel tools and approaches that we have pioneered to characterize multi-scale mechanical properties of small and delicate embryonic/fetal tissues, and it will discuss findings that have advanced the field's understanding of how tendons acquire their mechanical properties during tissue formation. We will highlight our exciting results that have led to the identification of therapeutic candidates that may restore normal biomechanics to adult and developing tendons and discuss implications for future translational directions for adult tendon treatments as well as in utero fetal interventions.

> AUGUST 8 – 11 2023 Knoxville, TN





PRESENTING AUGUST 10TH, 8:15AM- 9:15AM CYNTHIA REINHART-KING VANDERBILT UNIVERSITY

Cynthia Reinhart-King is a University Distinguished Professor, Senior Associate Dean for Research in the School of Engineering, the Cornelius Vanderbilt Professor of Engineering in Biomedical Engineering, and a Professor of Cell and Developmental Biology at Vanderbilt University. Prior to joining the Vanderbilt faculty in 2017, she was on the faculty of Cornell University where

she received tenure in the Department of Biomedical Engineering. She obtained undergraduate degrees in Chemical Engineering and Biology at MIT and her PhD at the University of Pennsylvania in the Department of Bioengineering. Her lab's research interests are in the areas of cell and tissue mechanics and cell migration as it relates to disease progression particularly in cancer, atherosclerosis, and angiogenesis. She was awarded the Rita Schaffer Young Investigator Award in 2010 and the Mid-Career Award in 2018 from the Biomedical Engineering Society, an NSF CAREER Award, the 2010 Sonny Yau '72 Excellence in Teaching Award, a Cook Award for "contributions towards improving the climate for women at Cornell," the Zellman Warhaft Commitment to Diversity Award from the Cornell College of Engineering, and the Vanderbilt Chancellor's Award for Research. She is a fellow of the Biomedical Engineering Society and the American Institute for Medical and Biological Engineering (AIMBE), and she was an inaugural New Voices Fellow of the National Academies of Science, Engineering and Medicine. She served as a standing member of the NIH CMT study section panel, and currently serves as an elected Board Member of AIMBE and President of the Biomedical Engineering Society.

The mechanics of cell movement within the tissue microenvironment

ABSTRACT: Cell migration is fundamental to numerous physiological processes including wound healing, development, and immune response, and it also occurs in diseases including cancer metastasis. During migration, cells navigate through tissue in response to various mechanical and chemical cues, overcoming various physical obstacles. As such, cells exert forces to move, and the generation of those forces requires that cells generate and expend energy. While there is a large body of literature about cell migration, less is known about the energetic requirements of cell locomotion. In this talk, I will discuss our work understanding how cells generate forces during migration and how they make and utilize the energy needed to generate those forces. Using single cell biosensors and novel microfabricated systems we have uncovered basic governing principles around energy generation during cell migration. This work points towards therapies that control cell migration by controlling cellular energy.



Award Winners



BORELLI AWARD

ELLEN M ARRUDA UNIVERSITY OF MICHIGAN

This is the most prestigious honor given by the ASB. The award recognizes outstanding career accomplishment and is awarded annually to an investigator who has conducted exemplary research in any area of biomechanics.

Professor Ellen M Arruda is the Tim Manganello / BorgWarner Department Chair and Maria Comninou Collegiate Professor of Mechanical Engineering at

the University of Michigan. She also holds appointments in Biomedical Engineering and in Macromolecular Science and Engineering. Professor Arruda earned her B.S. degree in Engineering Science and her M.S. degree in Engineering Mechanics from The Pennsylvania State University, and her Ph.D. degree in Mechanical Engineering from the Massachusetts Institute of Technology.

Under her leadership the Mechanical Engineering department earned the Inaugural MEDHEC Diversity, Equity, and Inclusion Award from the American Society of Mechanical Engineers in 2022 and the Rhetaugh G. Dumas Progress in Diversifying Award, from the University of Michigan, also in 2022. Recent recognition for her teaching, research, and service contributions to engineering include the 2021 Eringen medal from the Society of Engineering Science, the 2019 Nadai medal from the American Society of Mechanical Engineers, the 2018 Rice medal from the Society of Engineering Science, the 2015 Outstanding Engineering Alumnus Award from the Pennsylvania State University, the 2014 Distinguished Faculty Achievement Award from the University of Michigan, and the 2014 Trudy Huebner Service Excellence Award from the College of Engineering, University of Michigan.

Professor Arruda teaches and conducts research in the areas of theoretical and experimental mechanics of macromolecular materials, including polymers, elastomers, composites, soft tissues and proteins, and in tissue engineering of soft tissues and tissue interfaces. Her research programs include experimental characterization and analytical and computational modeling of soft materials, including native and engineered tissues. She has pioneered a novel inverse method to characterize the non-linear, anisotropic response of soft tissues such as the anterior cruciate ligament and the supraspinatus tendon.

Professor Arruda has over 100 papers in scientific journals with 15,000 citations. Her H-index is 47 (Google Scholar). Professor Arruda is a Fellow of the American Society of Mechanical Engineers, the American Academy of Mechanics, the Society of Engineering Science, and the American Institute for Medical and Biological Engineering. She is currently President of the American Academy of Mechanics. She is a member of the National Academy of Engineering (class of 2017).





JIM HAY MEMORIAL AWARD

RICHARD R. NEPTUNE

The Jim Hay Memorial Award recognizes originality, quality, and depth of biomechanics research that address fundamental research questions relevant to the extraordinary demands imposed in sport and exercise.

Dr. Richard R. Neptune earned his BS, MS and PhD in Mechanical Engineering from the University of California, Davis where his graduate advisor was Dr. Maury Hull. He then did a post-doc at the University of Calgary and

worked with Dr. Ton van den Bogert and Dr. Walter Herzog, and then as a Biomedical Engineer at the Palo Alto VA R&D Center where he worked with Dr. Felix Zajac and Dr. Steve Kautz. He has served on the Walker Department of Mechanical Engineering faculty at UT Austin since 2001 and recently completed a 6-year term as Department Chair. He directs the Neuromuscular Biomechanics Lab where they seek to improve the quality of life for individuals with movement disabilities by integrating musculoskeletal modeling, computer simulation and experimental analyses to identify the biomechanical and neuromotor mechanisms that contribute to locomotor impairments. His lab also seeks to improvevarious aspects of sports performance and the effectiveness of orthotic and prosthetic devices using design optimization and additive manufacturing techniques. He has served as an Associate Editor for the ASME Journal of Biomechanical Engineering and on the Editorial Board for the Journal of Applied Biomechanics. He has received a number of awards for his teaching and research including the CAREER award from the National Science Foundation, the Lockheed Martin Aeronautics Company Award for Excellence in Engineering Teaching from UT Austin, the Van C. Mow Medal from the American Society of Mechanical Engineers, and the Founders Award from the American Society of Biomechanics. He is a fellow of both the American Society of Biomechanics and the American Society of Mechanical Engineers. He currently holds the William and Bettye Nowlin Chair in Engineering.

Neuromechanical analyses of human movement: Insight into balance control mechanisms

Abstract: Maintaining balance is critical for successful completion of complex locomotor tasks that occur in both activities of daily living and in sports and exercise. This symposium will highlight how neuromechanical analyses have provided insight into intriguing questions related to sport and exercise including the maintenance of balance control. Then specific examples will be presented on how running-specific prostheses, different neuromuscular strategies and cortically-mediated components of muscle activity influence balance control during different locomotor tasks and across a spectrum of motor expertise.





FOUNDERS' AWARD

GREGORY S. SAWICKI GEORGIA TECH

The Founders' Award was established in 2017 to recognize scientific accomplishment in biomechanics and excellence in mentoring and is open to investigators of all disciplines within ASB.

Dr. Gregory S. Sawicki is an Associate Professor at Georgia Tech with appointments in the School of Mechanical Engineering and the School of Biological

Sciences. He holds a B.S. from Cornell University ('99) and a M.S. in Mechanical Engineering from University of California-Davis ('01).

Dr. Sawicki completed his Ph.D. in Human Neuromechanics at the University of Michigan, Ann-Arbor ('07) and was an NIH-funded Post-Doctoral Fellow in Integrative Biology at Brown University ('07-'09). Before joining Georgia Tech in August 2017, Dr. Sawicki spent 8 years as a faculty member in the Joint Department of Biomedical Engineering at NC State and UNC – Chapel Hill.

Dr. Sawicki directs the Physiology of Wearable Robotics (PoWeR) laboratory—where the goal is to combine tools from engineering, physiology and neuroscience to discover neuromechanical principles underpinning optimal locomotion performance and apply them to develop lower-limb robotic devices capable of improving both healthy and impaired human locomotion (e.g., for elite athletes, aging baby-boomers, poststroke community ambulators).

By focusing on the human side of the human-machine interface, Sawicki and his group have begun to create a roadmap for the design of lower-limb robotic exoskeletons that are truly symbiotic—that is, wearable devices that work seamlessly in concert with the underlying physiological systems to facilitate the emergence of augmented human locomotion performance.

Outside the lab, Greg enjoys spending as much time as possible exploring the outdoors by hiking, biking, and snowboarding when in the North or West with his partner, Katia Koelle, (an infectious disease biologist), and their daughters, Elodie and Sonja. Greg also seeks live music experiences whenever possible and never misses a Phish concert within the radius of a single day's drive.

The PoWeR of curiosity-driven team science – A 15-year quest to understand how exoskeletons can improve locomotion performance.

Abstract: "The goal of the Human Physiology of Wearable Robotics (PoWeR) Laboratory is to discover and exploit key principles of locomotion neuromechanics in order to build wearable devices that can augment intact and/or restore impaired human locomotion. Performance goals include improving economy, stability, and agility of human movement.

Over the last decade - enabled by an integrative, multi-scale approach that includes measures of wholebody metabolic energetics, limb-joint mechanics, and individual muscle-tendon neuromechanics - our lab has taken a 'deep-dive' to help reveal how exoskeletons interact with a human user's physiology to improve locomotion performance. Along these lines, I'll share a few of the 'greatest hits' from the PoWeR lab vault including: (i) How an unpowered ankle exoskeleton can improve human 'gas mileage' using tuned elastic springs as 'exo-tendons' (ii) Why it has been so hard to use ankle exoskeletons to reduce energy cost of



walking for stroke survivors and (iii) How a powered ankle exoskeleton that reacts faster than human reflexes can improve standing balance. Along the way I'll share a few of our favorite 'B-sides' and also how the collective experience doing research in our group has generated a set of key principles that I hope will guide us over the comings years as we strive to 'push beyond locomotion economy' and ask: What can exoskeletons do on the shortest and longest timescales (e.g., to tune reflex sensitivity or administer daily exercise training)?"



JEAN LANDA PYTEL AWARD FOR DIVERSITY MENTORSHIP IN BIOMECHANICS

ROBIN QUEEN VIRGINIA TECH

The Jean Landa Pytel Diversity Mentoring Award, started 2019, recognizes the long-term impact of mentoring on both the careers of individual scientists, including women and individuals from other traditionally underrepresented backgrounds in ASB, and the ultimate betterment of our society as a whole.

Professor Robin Queen is a researcher, scholar, and administrator. Her academic career includes establishing and leading research labs, instruction at the graduate and undergraduate levels, and serving universities and professional associations in varied leadership roles. Dr. Queen is professor of biomedical engineering and mechanics and has been with Virginia Tech since 2015. Prior to that, Dr. Queen served for 11 years as the director of the K-Lab at Duke University. Dr. Queen currently directs the Kevin P. Granata Biomechanics Laboratory where her work focuses on whole body mechanics with an emphasis on loading symmetry and functional outcomes and rehabilitation. In addition to her role as a professor in Biomedical Engineering and Mechanics, she is a Professor of Orthopaedic Surgery at the Virginia Tech Carilion School of Medicine and has affiliated appointments in several departments and institutes across Virginia Tech. Dr. Queen has served as a Faculty Fellow in the Office of the Vice President for Research and Innovation with an emphasis in data security and data management and is currently serving as the Vice President of the Virginia Tech Faculty Senate.

Dr. Queen has published several book chapters and more than 130 peer reviewed manuscripts in various basic science and clinical journals. Throughout her career Dr. Queen has been an active member of multiple professional societies where she has served on and chaired committees within each organization as well as serving on the executive board for the American Society of Biomechanics and the Orthopedic Research Society. In recognition of her contributions to the scientific community, Dr. Queen has been awarded Fellowship in three professional societies; the ACSM, ICORS, ASB, and in 2022 she was named as a fellow of the American Institute for Medical and Biological Engineering. In recognition of her scholarship, Dr. Queen was awarded the Kappa Delta Young Investigator Award (2017) for her work in Ankle arthritis and in 2020 received the ORS Adele L. Boskey, PhD Award in recognition of her outstanding and sustained commitment to mentorship and demonstrated track-record of impactful research. In addition to her research, Dr. Queen is passionate about the advancement of inclusion, diversity, and supporting women in leadership. Dr. Queen presently serves Virginia Tech and several national organizations as a leader in inclusion and diversity initiatives.



What to do when one size doesn't fit all.

Abstract: Throughout our careers we hold a variety of jobs that carry with them a variety of responsibilities. No matter your current career stage you are at times called to be a mentor while also being a mentee. The relationship between mentor and mentee changes with time as do those who we consider to serve in these roles. Sometimes mentorship is thought to be synonymous with advising or managing and often mentoring can mean so much more than just career advice or details on how to best complete assigned work. Others see mentors as the one person who is there to help at every step in the process and provide you with every-thing that is needed to be successful. During this presentation we will explore the importance of building mentoring teams and how these teams can, and I contend should change over time. In addition, we will discuss how to effectively communicate expectations for both the mentor and the mentee as we explore the idea that mentoring can't be a one size fits all approach. I will share my experiences in mentoring diverse teams and share what has worked as well as what hasn't worked. My hope is that at the end of this session you will have a few tangible things you can use in your mentoring relationships, within and outside of a working environment, to improve communication, set expectations, and meet your mentor/mentee where they are on their journey.



GOEL AWARD FOR TRANSLATIONAL RESEARCH IN BIOMECHANICS

KARL ZELIK VANDERBILT UNIVERSITY

The Goel Award, newly created in 2016, recognizes outstanding accomplishments in translational biomechanics research, entrepreneurship, and societal benefit.

Karl Zelik is an Associate Professor of Mechanical Engineering at Vanderbilt University, where he co-directs the Center for Rehabilitation Engineering and Assistive Technology. His overarching mission is to improve health, mobility, and independence for individuals with physical disabilities and to enhance human performance and well-being through advances in movement science and assistive technology. Zelik is also Co-Founder and Chief Scientific Officer of HeroWear, a workforce wearables company that makes back-relieving exosuits to support workers in logistics, manufacturing, and other physically-demanding jobs. Zelik serves on the Board of a non-profit called the American Bionics Project, which seeks to accelerate the development and adoption of revolutionary new technologies for people with lower-limb disabilities. He also performs biomechanics and wearable technology consulting work for industry, from startups to multinational corporations, through Zelik Biomech, LLC.

Stumbling into translational biomechanics.

Abstract: Prof. Zelik will share observations and lessons about translational biomechanics, entrepreneurship, technology transfer, and commercialization.

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ASB EARLY CAREER ACHIEVEMENT AWARD BEN BINDER-MARKEY DREXEL UNIVERSITY

Dr. Ben Binder-Markey, PT, DPT, PhD is an assistant professor at Drexel University in the Department of Physical Therapy and Rehabilitation Sciences with an affiliate appointment within the School of Biomedical Engineering, Sciences, and Health Systems. He completed his postdoctoral training in the Biologics Lab at the Shirley Ryan Abilitylab, his DPT training and PhD in

biomedical engineering at Northwestern University, and his bachelor's in mechanical engineering at the University of Delaware. His work integrates physical therapy, basic science, and engineering principles through the use of experimental and computational modeling methods to better understand how changes in muscle properties following injury or disease affect physical function. His work focuses on four main areas: understanding healthy muscle structure and function relationships, how muscle adaptions following injury or disease affect the function of the muscle and individual, mechanisms responsible for maladaptive muscle changes secondary to injury or disease, and development of novel interventions to reduce or prevent these adaptations. His work ultimately aims to alleviate muscle impairments following injury and disease, thus optimizing movement and physical function in individuals to improve their quality of life.

Significant intramuscular compliance is required to account for sarcomere shortening in the in situ human gracilis muscle.

Abstract: Computational musculoskeletal models are helpful in predicting muscle function. However, direct measurements of human muscle properties are extremely rare, and thus many models are never explicitly validated on human muscle. These models are either validated using direct measurements of mammalian muscles that are orders of magnitude smaller than human muscle or via indirect measurements of human muscle. Recently, we directly measured human gracilis isometric contractile properties, resting sarcomere length, and muscle dimensions during a free functioning gracilis surgical transfer, creating high-resolution data to validate current musculoskeletal models. As we moved the limb through its functional range, passive sarcomere lengths increased from an average of 3.2 µm to 3.5 µm. These sarcomere lengths were all longer than the optimal human sarcomere length of ~2.7 µm. However, the active force demonstrated the approximate shape of an active length-tension curve. Thus, the active sarcomere operating range covers both the ascending and descending portions of the curve. From these data, we predict significant sarcomere shortening is required when the muscle activates. However, this shortening is not observable when using a standard Hill muscle model in which bulk muscle is in series with bulk tendon because of the stiff serial tendon. Yet, a hill-type muscle model that includes a compliant intramuscular structure in series between the tendon and fiber was able to replicate our experimental observations. These data demonstrate that substantial sarcomere length changes must occur to reproduce the measured data. Such changes are not compatible with current lumped-parameter Hill muscle models.





ASB PRE-DOCTORAL ACHIEVEMENT AWARD **OWEN PEARL**CARNEGIE MELLON UNIVERSITY

Owen Pearl is a PhD candidate at Carnegie Mellon University advised by Eni Halilaj and Sarah Bergbreiter. He hails from Hershey, Pennsylvania, "The Sweetest Place on Earth", and received his BS and MS in Mechanical Engineering from Temple University. His research is motivated by a desire to help people move as they please and emphasizes the development of

new sensing techniques and sensor fusion algorithms to help us study human motion in new contexts with greater precision, ease, and affordability. Owen also loves teaching, and especially enjoys teaching physics and biomechanics through the kinesthetically engaging medium of percussion. He has led multiple National Biomechanics Day sessions where underserved and underrepresented students learn biomechanics through drumming.

Capacitive Sensing for Monitoring Muscle Activity in Natural Environments

Abstract: Inexpensive wearable sensors are expected to transform how we monitor patient movement outside of the laboratory and help personalize the treatment of mobility impairments. To meet these expectations, wearable sensors need to be benchmarked against clinical standards, provide reliable data over long periods of time, be robust to placement errors by non-experts, and show tangible translational potential. Inertial sensing remains the only wearable technology that has been comprehensively characterized and benchmarked against gold-standard biomechanical measurements, but it remains sensitive to both drift and placement error and does not provide estimations of muscle activity, which are relevant to both mobility impairments and the development of assistive wearables. Here we characterize capacitive sensing as a gait rehabilitation monitoring technology, finding for the first time that it can accurately track changes in muscle bulging and fiber length with the fidelity of laboratory tools, across people of different age groups and body compositions, and in natural environments. We also show that capacitive sensing complements inertial sensing better than electromyography in multimodal wearable sensing systems and demonstrates its translational relevance in two clinical applications. We expect this foundational study of capacitive sensing to be applicable to a wide range of mobility-related pathologies and emerging human-in-the-loop assistive devices.





ASB JUNIOR FACULTY RESEARCH AWARD 2023 BRITTANY HEINTZ WALTERS SEATTLE UNIVERSITY

Dr. Brittany Heintz Walters received her PhD in Kinesiology from the University of Wisconsin-Milwaukee before her current role as an Assistant Professor of Neuromechanics and Motor Control and Associate Chair of the Department of Kinesiology at Seattle University. Her research focuses on neuromuscular changes associated with movement impairments in healthy

older adults and in those with movement disorders, with an emphasis on the visuomotor system and hand function. Dr. Heintz Walters uses techniques such as EMG, motion analysis, and eye tracking technologies to understand mechanisms underlying the control of movement. The overarching goal of her research is to mitigate movement impairments and increase functional independence in older adults and patient populations.

Developing a thermally actuated soft robot to improve hand function in stroke

Abstract: Impaired hand function is one of the most common motor deficits after stroke and an affordable, accessible device for hand rehabilitation is needed. High-frequency, high-duration repetitive movements guided by a therapist can improve hand function though this rehabilitation can be labor-intensive and time-consuming. Robotic devices have been developed to supplement traditional rehabilitation, but many are costly, complex, and made of rigid materials, decreasing widespread use. To overcome these barriers, our team is developing a thermally actuated soft robot that is lightweight, easily fabricated, and approximately 10% the cost of other devices. Designed based on Pneumatic Network Actuator architecture, device actuation is achieved through increased temperature when submerged in warm water. This talk will explore the development of the thermally actuated soft robot, including recent kinematic assessment in healthy adults supported by the ASB Junior Faculty Research Award. Future work seeking continued development will also be discussed within the longer-term goal of creating an affordable, accessible device for hand rehabilitation in stroke survivors.





ASB JUNIOR FACULTY RESEARCH AWARD 2024 **KRISTYNE WIEGAND**

EASTERN WASHINGTON UNIVERSITY

Determining the Effectiveness of Footwear as an Intervention for Plantar Fasciitis in Female Recreational Runners

Dr. Kristyne Wiegand is an Assistant Professor of Exercise Science at Eastern Washington University. Her research aims to better understand the mechanical,

physiological, and psychological aspects of musculoskeletal injuries, particularly regarding overuse running injuries. Plantar fasciitis the most common foot injury in runners and the third most common running injury overall. Despite this prevalence, we do not fully understand the mechanisms that underlie the development and progression of plantar fasciitis. Research suggests that females have a greater incidence rate of plantar fasciitis, which is thought to be caused by an increase in mechanical load on a thinner plantar fascia. Plantar fasciitis is often treated with orthotics, though it is not fully known whether cushioned footwear can be used as an alternative treatment option, specifically in female runners. The purpose of this ASB Junior Faculty Research Award funded project is to determine the effect of ultra-cushioned footwear on movement mechanics and plantar fasciitis pain over a 12-week period. Our findings may help better understand the mechanical causes of chronic plantar fasciitis and may present viable alternative treatment options for female recreational runners.



RESEARCH TRAVEL GRANT

KAREN TROY *WORCESTER POLYTECHNIC INSTITUTE*

One focus of my laboratory is to better understand the biomechanical environment of the metatarsals during running. This is important because metatarsal bone stress injuries are quite common in runners and military professionals, and we believe there are several modifiable biomechanical factors that could reduce the risk of such injuries. The feet are extremely complex and include

multiple interactions between bones and passive soft tissue structures, making it difficult to understand metatarsal loading. Because we do not understand how forces are transmitted through these structures during weightbearing, we do not know how the metatarsals are loaded or what factors contribute the magnitude and direction of these loads. The goal of this Research Travel Grant is to collaborate with Dr. Amy Lenz, a foot and ankle expert at the University of Utah. Dr. Lenz's laboratory currently houses a six-axis industrial robot customized to interface with a tibial plateau to toe tip cadaveric specimen. Our primary goal is to collect strain gage data on the metatarsals of intact feet during physiologic loading and motion. This will provide us with important information about the forces and moments transmitted through the metatarsals. Critically, it will help us understand the proportion of the ground reaction force that is transmitted through other structures within the foot. Short-term, this will inform some of the mechanical testing that we have planned in my lab. Longer term, we hope to expand this collaboration to better understand foot biomechanics. I look forward to sharing our results with the broader biomechanics community!



UP AND COMER AWARDS

The "Up and Comer" Award, sponsored by the ASB Council of Fellows, is intended to foster mentoring and networking of post-doctoral trainees and early career faculty with ASB Fellows of similar research interests.



ERICA A BELL MAYO CLINIC

Dr. Erica Bell is a fourth-year postdoctoral fellow at Mayo Clinic. Since obtaining her PhD in 2019, Dr. Bell has been highly active within the scientific community, serving as an abstract reviewer, session moderator, and on various program planning committees for regional, national, and international scientific conferences including the American Society of Biomechanics, the International Society of Biomechanics, and the Biomedical Engineering

Society. Dr. Bell's main research interests focus on using image-based modeling of bone and soft tissue to examine injury mechanisms and to better understand tissue and joint function. Ultimately, Dr. Bell is passionate about a career leading research teams in topics that have the potential to produce direct functional outcomes in clinical practice and performance enhancement.

Beyond traditional research training, Dr. Bell is a cofounder of the Black Biomechanists Association (BBA), a certified non-profit service-based organization with a mission to uplift and enrich Black biomechanists in their academic and professional careers. Through BBA, she has helped develop, coordinate, and moderate multiple conference workshops and panels on diversity, equity, and inclusion (DEI) related topics that are relevant to and directly impact the research community. Dr. Bell is passionate about being a leader in advocating for DEI in STEM academic and research spaces. Although early in her career, it is extremely important to not only advocate for her own career, but also to help pave a pathway to make academic and research spaces more accessible for young Black students and Black scientists.



FRANKIE WADE UNIVERSITY OF ILLINOIS

Dr. Frankie Wade is currently a postdoctoral researcher at UIC in the Department of Kinesiology and Nutrition. Prior to this, she completed a postdoc at the University of Florida, a PhD in Kinesiology at Penn State University. Before moving to the US, Dr. Wade earned an MSc in Sports Biomechanics at Loughborough University, and a BSc (Hons) in Sport and Exercise Science at the University of Bath, both in England. Her current

research is focused on helping promote mobility to maintain independence as we age, and how our environment and perception of our abilities influence our walking.



Dr. Wade is committed to ensuring equitable and accessible science and leads The Ally Corner through the Black Biomechanics Association. She has written several blog posts for the International Women in Biomechanics, served as a first-generation life coach, and undergone training in multicultural mentoring and diversity, equity, and inclusion in pedagogy. As a first-generation, international scientist, she understands the need for transparency in science, and is passionate about creating a space where people who feel intimidated by science and research feel welcome and able to explore biomechanics freely.

She thinks of herself as a solar-powered human who is happiest underwater. Outside of work, you can find her freediving, surfing, or practicing yoga on the beach.

MEETING AWARDS

At each Annual Meeting, ASB honors excellence in research presented at the meeting. Individual meeting awards are selected based on the quality of the abstract submissions and oral presentations (Journal of Biomechanics and Clinical Biomechanics Awards).

JOURNAL OF BIOMECHANICS AWARD FINALISTS

Developmental plasticity of muscle architecture in response to chronic limb loading

Kavya Katugam-Dechene; Talayah Johnson; Stephen Piazza; Jonas Rubenson

Cortical error assessment is greater in dancers than nondancers.

Kennedy Kerr; Scott Boebinger; Jasmine Mirdamadi; Lena Ting

Towards gait symmetry improvement using automatic robotic assistance personalization control for active hip exoskeletons

Qiang Zhang; Ming Liu; Xikai Tu; Jennie Si; Michael Lewek; He (Helen) Huang

CLINICAL BIOMECHANICS AWARD FINALISTS

Two minutes is sufficient to characterize the viscoelastic properties of the human lower birth canal during the first stage of labor.

Mariana Masteling; John DeLancey; James Ashton-Miller

Plantarflexor Central Drive Symmetry is Associated with Poststroke Walking Function in Community Ambulators

Ashley Collimore; Jonathan Alvarez; David Sherman; Conor Walsh; Louis Awad

High intensity gait and balance training improves control of center of mass motion during walking in people with incomplete spinal cord injury.

Anna Shafer; Shamali Dusane; Heather Henderson; Keith Gordon



STUDENT TRAVEL AWARDS

Martins Amaechi, University of Nebraska Omaha Rodolfo Amezcua-Cerda, University of Southern California Anna Bailes, University of Pittsburgh Lilla Caton, Penn State Brooke Christensen, University of California, Irvine Ashley Collimore, Boston University **Obinna Fidelis**, University of Tennessee Knoxville Aubrey Gray, University of North Carolina at Chapel Hill Madeline Grosklos, The Ohio State University Kavya Katugam, Pennsylvania State University Rucha Kulkarni, Northwestern University Benjamin Lerch, Pennsylvania State University, Harrisburg Grant Maddox, University of Florida Julia Manczurowsky, Northeastern University Mariana Masteling, University of Michigan **Timothy McGinley**, Drexel University Kelsey Neal, University of Delaware Ria Rao, Boston University Reagan Recchia, University of Michigan Ridhi Sahani, University of Virginia **Dylan Schmitz**, University of Wisconsin – Madison Oliver Silverson, University of Minnesota Medical School Samantha Snyder, University of Maryland Zoe Villamar, Northwestern University Jordan Wilson, University of Dayton

GRADUATE STUDENT GRANT-IN-AID PROGRAM

Aubrey Gray, Joint Department of Biomedical Engineering, University of North Carolina Chapel Hill and North Carolina State University
Jorie Budzikowski, Northwestern University
Molly Shepherd, Washington University in St. Louis
Jacob Thomas, University of Missouri

WS1: Developing Engaged Teaching Strategies in Biomechanics

August 8th, 2023, 8:00am – 12:00pm

Kristyne Wiegand¹, JJ Wallace², Matt Wittstein³, Matthew McCullough⁴ ¹Eastern Washington University, ²Transylvania University, ³Elon University, ⁴North Carolina A&T State University

WORKSHOP OVERVIEW

The goal of this workshop is to aid in course development and engage learning strategies for individuals who teach biomechanics at the undergraduate and graduate levels. Educators who are interested in becoming more effective in course design, assessment development, and active learning techniques are encouraged to attend. The workshop will include an overview of current pedagogical strategies such as backward course design, framing, and modern technology tools for teaching. After this introduction, participants will have time and support to develop specific deliverables including syllabus/course design, engaged learning sessions, assignments (including lab activities), and assessments. The workshop will conclude with a debrief, where participants will be encouraged to discuss their deliverables, brainstorm additional goals, and learn about and contribute to the new ASB Teaching Repository.

During the workshop, individuals will have the opportunity to connect with instructors from similar programs or institutions. The application of skills may contribute to lecture or lab-based classes. The overall goal is to help develop an actionable, tangible component that is informed by recent pedagogical techniques and can be implemented quickly into current practice. Equity and inclusion, technology in the classroom, and the integration of modern pedagogical techniques will be highlighted. Attendees will be encouraged to add their findings to a dedicated section of the ASB Teaching Repository and will be invited to participate in a Virtual Community of Practice (VCoP) intended to continue conversations, make ongoing teaching improvements, and develop community among biomechanics educators. The VCoP will meet twice after the 2023 ASB Annual Meeting.

WS2: Stroke Grand Challenge Competition and NMSM Pipeline Training Workshop

August 8th, 2023, 8:00am – 12:00pm

B.J. Fregly¹, Carolynn Patten², Claire Hammond¹, Spencer Williams¹, Marleny Vega¹ ¹Rice University, ²University of California at Davis

WORKSHOP OVERVIEW

This workshop will present a new "Stroke Grand Challenge Competition" to be held for the next three years at the American Society of Biomechanics conference, along with the new Matlab-based "Neuromusculoskeletal Modeling Pipeline" (NMSM Pipeline) that enhances OpenSim with model personalization and treatment optimization functionality. The competition will challenge the research community to use personalized neuromusculoskeletal models to design personalized neurorehabilitation treatments that improve walking function for three individuals post-stroke. Researchers can perform the computational



treatment design process using the NMSM Pipeline or any other software. Each year of the competition, extensive experimental walking data (video motion capture, split-belt instrumented treadmill, surface and fine-wire EMG, and metabolic cost) collected from a different individual post-stroke will be released to the research community on Simtk.org, along with a personalized neuromusculoskeletal model developed using the NMSM Pipeline and OpenSim. Researchers will use a personalized model and predictive walking optimizations to design a personalized neurorehabilitation intervention that maximizes recovery of bilateral walking symmetry and normal walking speed. The workshop will be presented in two parts. The first part will describe the "Stroke Grand Challenge Competition" and NMSM Pipeline software, including the four-phase model personalization process (joint, muscle-tendon, neural control, and ground contact model personalization) and three-phase treatment optimization process (tracking, verification, and prediction optimization). The second part will present interactive training tutorials for each phase of the model personalization and treatment optimization process.

WS3: Basic Fractal Analysis In Movement Science

August 8th, 2023, 8:00am – 12:00pm

Aaron Likens¹, Kolby Brink¹, Maria Eleni Kalaitzi Manifrenti¹, Joel Sommerfeld¹ ¹University of Nebraska-Omaha

WORKSHOP OVERVIEW

Time series in movement science are often noisy and irregular, creating numerous analytical challenges. Examples such as heart rate, respiratory rate, and spatiotemporal gait parameters all vary considerably over multiple time scales, ranging from a few milliseconds to several minutes and beyond. Traditional linear statistics do not capture the temporal changes that occur across time scales. Nonlinear analyses are methods to quantify the complexity of human movement, providing a window into the underlying interactions of coordinative processes. Nonlinear analyses also capture changes in movement dynamics that are commonly missed using linear measures. One common class of nonlinear analysis, collectively known as fractal analysis, provides a robust means for exploring movement dynamics defined by many time scales. This workshop will introduce fractal theory and its relevance in human movements and physiology. In addition, workshop attendees will be provided with hands-on instruction in applying basic fractal analysis on human movement data. Recent developments will also be presented. Upon workshop completion, participants will acquire (1) a deeper understanding of the underlying mathematics and theory on fractality in movement science, (2) novel approaches of fractal analyses that overcome data length limitations, (3) software for performing analyses on their own data, and (4) knowledge on best practices for fractal analysis in research. Attendees are strongly encouraged to bring their own data to maximize learning experience; example datasets will also be provided. The only prerequisites are college level algebra and a basic proficiency with MATLAB. Participants of all backgrounds including researchers, clinicians, and students of all levels are encouraged to attend.



WS4: Creating the Future of Biomechanics Through Comprehensive Admissions Practices

August 8th, 2023, 1:00pm – 5:00pm

Ajit Chaudhari¹, Matthew McCullough², Kharma Foucher³, Michelle Sabick⁴ ¹Ohio State University, ²North Carolina Agricultural and Technical State University, ³University of Illinois Chicago, ⁴University of Denver

WORKSHOP OVERVIEW

STEM fields like Biomechanics need to become more equitable, diverse and inclusive to attract, support, and retain future generations of Biomechanists. The large majority of members of the American Society of Biomechanics (ASB) are faculty or students in academic institutions. One of the most accessible, and impactful, actions these members can take to achieve a more equitable, diverse, and inclusive future is to understand and better support comprehensive admissions practices. ASB members in industry also benefit from understanding these practices, as they are readily applicable to hiring and promotion practices. Comprehensive admissions practices such as grade point average and standardized test scores. Comprehensive admissions practices present several advantages over more traditional admissions practices based primarily on test scores and grades: (1) they help identify and recruit students who are more likely to complete their degree program and be successful in the long term; and (2) they help to recruit a more diverse student body. This workshop will include presentations on these topics and small-group discussions for attendees to develop personal action plans that advance comprehensive review at their organization or their ability to succeed when applying for programs or positions that use comprehensive review.

WS5: Federal Funding for Biomechanics Research

August 8th, 2023, 1:00pm – 3:00pm

Jennifer Jackson¹, Toyin Ajisafe¹, John Holden¹, Lucy Zhang², Stephanie George², Brian Schulz³, Elizabeth Russell Esposito⁴

¹National Institutes of Health, ²National Science Foundation, ³Veterans Health Administration, ⁴Department of Defense

WORKSHOP OVERVIEW

The federal government funds biomechanics research and has numerous available funding opportunities across multiple agencies. This workshop will include representatives from the National Institutes of Health (NIH), National Science Foundation (NSF), Veterans Health Administration (VHA), and U.S. Army Medical Research and Development Command (USAMRDC). They will present current information on research programs and initiatives, training and career development opportunities, and application and review processes. Differences between agencies will also be highlighted. Federal representatives attend conferences like ASB to keep abreast of cutting-edge science, meet with attendees, disseminate funding opportunities, and answer applicant or grantee questions. Some federal representatives may be able to connect people performing similar research or addressing related research questions from different angles to facilitate new collaborations. Attendees will have opportunities during the workshop and the conference to reach out to these individuals for additional information or with questions. After presentations by designated speakers from each agency, there will be open Q&A for all panelists. Contact information will be provided. This workshop is appropriate for researchers of all career stages, from trainees to senior investigators. Participants will gain a greater understanding of the federal funding application and review processes, as well as similarities



and differences between the respective funding agencies. Speakers will provide diverse options for research opportunities while bringing unique perspectives on how and where to apply for funding.

WS6: Enabling Large-Scale Biomechanics Studies and Data Sharing Using Opencap and Addbiomechanics

August 8th, 2023, 1:00pm – 3:00pm

Scott Delp¹, Scott Uhlrich¹, Matthew Petrucci¹, Keenon Werling¹, Melissa Boswell¹ ¹Stanford University

WORKSHOP OVERVIEW

Biomechanical measurements have the potential to predict and prevent injury, monitor disease progression, and inform clinical interventions. Traditionally, these measurements require expensive equipment and trained personnel, which typically limits studies to a small number of participants. Biomechanical data are also time-consuming to process, aggregate, and share. We are creating two new tools, OpenCap and AddBiomechanics, which enable researchers to more easily and guickly collect, analyze, and share data. OpenCap (opencap.ai) measures three-dimensional human movement using smartphone videos; AddBiomechanics (addbiomechanics.org) performs automatic scaling of OpenSim models and computes inverse kinematics and dynamics from motion capture files. These tools were released in 2022 and are now in use by hundreds of biomechanics researchers. In this tutorial, participants will learn how these new tools have been validated and how they expedite lab-based and out-of-lab studies of hundreds of participants, with applications to movement screening, injury prevention, and monitoring rehabilitation. A hands-on tutorial will teach participants how to incorporate these tools into their research to obtain high-quality data and develop expertise in common workflows for simulation and analysis. To conclude, we will discuss how these tools support data sharing and large-scale analysis in biomechanics research. Large, high-quality, and aggregated movement datasets will enable researchers to utilize machine learning and other techniques to discover novel biomarkers that are robust and reliable. We welcome participants and the larger biomechanics community to use these new tools and become part of the community of users collecting and sharing biomechanics data to advance the field.

WS7: Writing a Successful NIH R01 Proposal

August 8th, 2023, 4:00pm – 6:00pm

Daniel Ferris¹, Kat Steele², Jason Franz¹, Helen Huang³, Jonas Rubenson⁴, Jennifer Nichols¹ ¹University of Florida, ²University of Washington, ³University of Central Florida, ⁴Pennsylvania State University

WORKSHOP OVERVIEW

This workshop brings together a collection of NIH-funded biomechanics investigators to provide advice and answer questions on how to succeed at obtaining an R01 research award.





Introduction to an Open-Source Approach to Bi-Plane Videoradiography and Multi-Modal Kinematic Tracking

J.J. Trey Crisco, Jillian Beveridge, Beatriz Paniagua, Michael Rainbow, Kristin Zhao Brown University

We are developing an extensible, open-source software program for image-based skeletal and implant motion tracking with NIH support that will compute six degree-of-freedom kinematics from videoradiography, 3DCT, or 4DCT image datasets. The goal of this symposium is to share our progress on the development and testing and, importantly, get critical feedback from a wide range of potential users as progress towards the grant aims progresses. This symposium will provide a bridge between basic science, kinesiology, engineering, and clinical domains. It is an educational resource and encourages discussion and collaboration among ASB attendees.

Turning towards real-world maneuvers to inform movement training paradigms

Antonia Zaferiou, Jonathan Dingwell, Peter C Fino, Carolin Curtze Stevens Institute of Technology

This session will include 4 x 15 minute talks followed by a 30 minute panel. The talks were carefully curated to progress from introductory background and turning mechanisms (Zaferiou), to advanced computational approaches during diverse stepping maneuvers (Dingwall) and complementary approaches to study turns clinically (Fino), and finally reach discussion of the clinical implications of the trade-off between stability and agility during turns (Curtze).

How to Get Involved with Biomechanics Education Research

Allison R Altman-Singles, Courtney Faber, Amelia S Lanier, Scott M Monfort, Kimberly E Bigelow Penn State Berks

In an effort to demystify and promote additional education research, this symposium will feature a STEM education expert, who will walk listeners through the process of posing an education-research question, obtaining the appropriate approvals, getting funding, executing the research, and reporting the research. Following the presentation, we will transition into a panel discussion.

Biomechanics Research and Development Outside of Academia

Maria P Pasquale, Marcus Brown, Alison Sheets-Singer, Ray Browning *Novel Electronics Inc.*

The symposium will include an individual presentation from each of the participants followed by a 30-minute panel discussion of the biomechanics concepts presented therein. While these presentations will focus on the science, questions related to personal experience will be encouraged spurring further information flow between students and faculty members interested in understanding how biomechanics is used within non-academic roles.


Affinity Groups at the 2023 ASB Meeting

IWB SOCIAL HOUR

At an off-site restaurant (TBC) on Aug 8, 19:00

Join the International Women in Biomechanics for a social hour on Tuesday August 8th to kick off ASB 2023! This is a great way to meet other women in a casual, social setting before the conference even begins! This event is open to individuals of all career stages, those who identify as women or an underrepresented gender, and allies!

Learn more about IWB: intlwomxninbiomech.wixsite.com/website

MENTAL HEALTH BREAK (sponsored by BBA & LiB)

At the Knoxville Convention Centre on Aug 9, 13:30-14:30

Conferences are enriching and fun but can get overwhelming. The Black Biomechanists Association (BBA) & Latinx in Biomechanix (LiB) would like to encourage everyone, and particularly underrepresented scholars, to take a mental break from science to recharge and continue to present your best self. Join us for relaxing yoga, coloring, and free writing activities. Attendees will also have the chance to win prizes in a free raffle!

CHRISTIAN BIOMECHANICS FELLOWSHIP

At the Knoxville Convention Centre on Aug 10, 13:00-14:00

Come meet with other Christian faculty, researchers, and students in the biomechanics community over lunch for a time of fellowship and encouragement. Grab your lunch and stop by!

PROFESSIONAL DEVELOPMENT SESSION FOR EARLY CAREER FACULTY

At the Knoxville Convention Centre on Aug 10 at 18:00-19:30

The aim of this event is to provide an opportunity for early career faculty (and similar) to receive advice from ASB fellows and other senior members on topics relevant to setting up successful research and/or teaching programs and facilitate discussion on how to address the unique challenges facing early career faculty.

TEACHING BIOMECHANICS IN THE "NEW NORMAL"

At the Knoxville Convention Centre on Aug 10, 18:00-19:30

The Teaching Biomechanics Interest Group (T-BIG) was started in 2020 among a group of teaching-focused biomechanists. Since that time, they have shared advice and resources, collaborated on projects, and run conference programming to support and overcome the challenges of teaching in this nuanced field. Examples of these initiatives have centered around promoting undergraduates and undergraduate research and supporting biomechanists from primarily undergraduate institutions. Biomechanists at all levels and types of institutions are welcome to join.



The affinity group event will be an informal, discussion-oriented event. This networking event will include a brief introduction on the accomplishments of the group thus far along with the short- and long-term goals of the group. The bulk of the time will be reserved for break-out groups to allow participants to meet faculty from other programs and to discuss how teaching has changed over the past few years, for better or worse. This will provide everyone with an opportunity to learn what has worked well and give us all a chance to vent about what didn't work.

Please join the T-BIG Slack to get involved and receive regular T-BIG updates. join.slack.com/t/t-big/shared_invite/zt-1ad7u29wh-DaPaby3coO3wRYq3P4BMZg

YOUR GATEWAY TO ENDLESS OPPORTUNITIES



IMPROVE HUMAN PERFORMANCE

Setting standards for human movement research and treatment





Podium Sessions

LOCOMOTION ENERGETICS

Chairs: James Finley, Russell Johnson

146501 Energetics of walking with within-stride changes in treadmill speed

Caitlin Banks

Caitlin Banks¹, Junyao Li², Jan Stenum¹, Ryan Roemmich¹ ¹Kennedy Krieger Institute, ²Johns Hopkins University

146619 The timescales of mediolateral stability and energetic cost during gait adaptation

Sarah Brinkerhoff Sarah Brinkerhoff¹, Jaimie Roper¹ ¹Auburn University

146660 The spring-like function of the foot's arch reduces the metabolic cost of simulated gait in a gait mode specific manner

Daniel Davis

Daniel Davis¹, John Challis¹ ¹The Pennsylvania State University

146680 How can lower body joint work be used to estimate energetic cost of walking?

Evan Dooley

Evan Dooley¹, Katherine Knaus², Allison Lehmann¹, Shawn Russell¹ ¹University of Virginia, ²University of California, San Diego

146889 *Shear wave velocity of lower limb tendons is not correlated with metabolic power in human locomotion*

Alex Denton

Alex Denton¹, Susann Wolfram¹, David Lipps¹, Brian Umberger¹ ¹University of Michigan

146952 Impact of triceps-surae operating lengths on whole body metabolic cost

Jordyn Schroeder

Jordyn Schroeder¹, Owen Beck², Jason Franz³, Gregory Sawicki¹ ¹Georgia Institute of Technology, ²University of Texas at Austin, ³University of North Carolina at Chapel Hill & North Carolina State University



OSSEOINTEGRATED PROSTHESES

Chairs: Brad Hendershot, Ross Miller

146493 Balance confidence and walking margin of stability symmetry after lowerextremity prosthesis osseointegration: a case series

James Tracy

James Tracy¹, Mohamed Awad¹, Danielle Melton¹, Jason Stoneback¹, Brecca Gaffney², Cory Christiansen¹ ¹University of Colorado - Anschutz Medical Campus, ²University of Colorado Denver

146497 *Muscle-driven, implanted foot-ankle endoprosthesis recovers gait kinematics*

Katrina Easton

Katrina Easton¹, Caleb Stubbs¹, Caroline Billings¹, Kristin Bowers¹, Stacy Stephenson², Cheryl Greenacre¹, David Anderson¹, Dustin Crouch¹

¹The University of Tennessee at Knoxville, ²University of Tennessee

146526 Gait symmetry and functional mobility in service members with transfermoral and contralateral transtibial limb loss after bilateral and unilateral osseointegration

Julian Acasio

Julian Acasio¹, Clare Severe², Bradford Hendershot¹, Christopher Dearth¹, Julio Rivera², Jonathan Forsberg³, Benjamin Potter³

¹Extremity Trauma and Amputation Center of Excellence, ²The Henry M. Jackson Foundation, ³Uniformed Services University of the Health Sciences

146531 Biomechanical and mobility outcomes of service members with bilateral transfemoral amputation before and 12 months after osseointegration

Clare Severe

Clare Severe¹, Julian Acasio², Bradford Hendershot², Christopher Dearth², Julio Rivera³, Jonathan Forsberg⁴, Benjamin Potter³

¹The Henry M. Jackson Foundation, ²Extremity Trauma and Amputation Center of Excellence, ³Uniformed Services University of the Health Sciences, ⁴Walter Reed National Military Medical Center

146635 *Knee joint biomechanics before and after transtibial prosthesis osseointegration*

Amanda Vinson

Amanda Vinson¹, Nicholas Vandenberg¹, Mohamed Awad², Danielle Melton², Cory Christiansen², Jason Stoneback², Brecca Gaffney¹

¹University of Colorado Denver, ²University of Colorado - Anschutz Medical Campus

146696 *Predicting the effects of hip strength changes on gait dynamics in patients with transfemoral amputation*

Nicholas Vandenberg

Nicholas Vandenberg¹, Benjamin Wheatley², Mohamed Awad³, Danielle Melton³, Cory Christiansen³, Jason Stoneback³, Brecca Gaffney¹

¹University of Colorado Denver, ²Bucknell University, ³University of Colorado - Anschutz Medical Campus



EDUCATION AND OUTREACH

Chairs: Allison Altman-Single, Sara Arena

146455 Quantifying the impacts and challenges of undergraduate research

Brooke Odle

Brooke Odle¹, Craig Goehler², Allison Altman-Singles³, David Phillips⁴, Michael Potter⁵, Mukul Talaty⁶, Jacob Hinkel-Lipsker⁷, Kimberly Bigelow⁸

¹Hope College, ²University of Notre Dame, ³Pennsylvania State University, Berks, ⁴Oregon State University, ⁵Francis Marion University, ⁶Pennsylvania State University, Abington, ⁷California State University, Northridge, ⁸University of Dayton

146713 *Leveraging a common theme for assistive device design projects in a course*

Allison Kinney

Allison Kinney¹, Kimberly Bigelow¹ ¹University of Dayton

146745 Encouraging growth mindsets in undergraduate kinesiology

Brian Selgrade Brian Selgrade¹, Stephanie Scoville¹ ¹Westfield State University

146757 Implementation of the black biomechanics speaker series at the University of Dayton

Jordan Wilson

Jordan Wilson¹, Kimberly Bigelow¹ ¹University of Dayton

146942 "Put Me in the Zoo": research and outreach at a zoo biomechanics day

Cassandra Shriver

Cassie Shriver¹, Audra Davidson¹, Young-Hui Chang¹, David Hu¹, Joseph Mendelson III², Staci Wiech³, Andrew Schulz⁴

¹Georgia Institute of Technology, ²Georgia Institute of Technology and Zoo Atlanta, ³Zoo Atlanta, ⁴Max Planck Insitute for Intelligent Systems

146946 Embedding entrepreneurially-minded learning into undergraduate research

experiences

Kimberly Bigelow

Kimberly Bigelow¹ ¹University of Dayton



OPTIMAL CONTROL SIMULATION

Chairs: Jill Higginson, Kayla Pariser

146811 *Comparison of cost functions for estimating individual-muscle activations in human and chimpanzee bipedal walking*

Aravind Sundararajan

Aravind Sundararajan¹, Susan Larson², Brian Umberger³, Matthew O'Neill¹ ¹Midwestern University, ²Stony Brook University, ³University of Michigan

146488 Motor modules are largely unaffected by different walking biomechanics

Mohammad RahimiGoloujeh Mohammad RahimiGoloujeh¹, Jessica Allen¹ ¹University of Florida

146500 Predictive simulation of poststroke adaptive treadmill gait

Kayla Pariser Kayla Pariser¹, Jill Higginson¹ ¹University of Delaware

146631 *Mapping from performance criteria to human gait behavior*

Matthew Mulligan Matthew Mulligan¹, Wenxin Zhou¹, Brian Umberger¹ ¹University of Michigan

146722 The effects of weakness, contracture, and altered control on walking energetics during crouch gait

Elijah Kuska Elijah Kuska¹, Michael Schwartz², Katherine Steele¹ ¹University of Washington, ²Gillette Children's Specialty Healthcare

146769 Investigation of pitching mechanics to reduce injury risk using optimal control

Tylan Templin

Tylan Templin¹, Sakiko Oyama², Travis Eliason¹, Daniel Nicolella¹ ¹Southwest Research Institute, ²The University of Texas at San Antonio



SKELETAL MUSCLE MECHANICS

Chair: Silvia Blemker

146868 *Muscle Shear Modulus Is Greater in the Plane Parallel to Muscle Fibers Compared to the Perpendicular Plane*

Daniel Ludvig

Daniel Ludvig¹, William Reyna¹, Eric Perreault¹ ¹Northwestern University

146470 Use of subject-specific parameters for predicting passive force in musculoskeletal models: an investigation of their accuracy

Lomas Persad

Lomas Persad¹, Benjamin Binder-Markey², Alexander Shin¹, Richard Lieber³, Kenton Kaufman¹ ¹Mayo Clinic, ²Drexel University, ³Shirley Ryan AbilityLab

146771 Coupled experiments and mechanical models highlight the role of collagen organization on passive muscle tissue properties by mediating nonuniform stiffness and strains across extracellular matrix layers

Ridhi Sahani

Ridhi Sahani¹, C. Hunter Wallace², Silvia Blemker¹ ¹University of Virginia, ²University of California, Irvine

146780 Sensitivity of simulated gaits to assumed muscle mass and specific tension

Sheeba Davis

Sheeba Davis¹, Matthew O'Neill², Brian Umberger¹ ¹University of Michigan, ²Midwestern University

146866 *Physiological Storage Solution Decreases Whole Muscle Passive Mechanical Properties*

Timothy McGinley

Timothy McGinley¹, Benjamin Binder-Markey¹ ¹Drexel University

146913 *Relating muscle physiological characteristics to in vivo muscle dynamics*

Marie Janneke

Schwaner Marie Schwaner1, Dean Mayfield2, Emanuel Azizi1, Monica Daley1 1University of California, Irvine, 2University of California, Riverside



SHOULDER HEALTH

Chairs: Meghan Vidt, Brooke Slavens

146187 *Finite element analysis of acromial fracture risk after reverse shoulder arthroplasty*

Don Anderson

Joshua Johnson¹, Maria Bozoghlian¹, Brendan Patterson¹, Donald Anderson¹ ¹University of Iowa

146413 *Reductions in shoulder function following mastectomy and breast reconstruction*

Joshua Pataky

Joshua Pataky¹, Jared Heitzenrater², Kathryn Schmitz³, Daleela Dodge², John Potochny², Kristine Widders², Melody Paulishak², Dino Ravnic², Cathy Henry², Timothy Johnson², Kavita Vakharia², Meghan Vidt⁴ ¹Pennsylvania State University, ²Penn State College of Medicine, ³University of Pittsburgh, ⁴Pennsylvania State University; Penn State College of Medicine

146420 Comparison of glenohumeral kinematics between individuals with instability and healthy controls

Oliver Silverson

Oliver Silverson¹, Gaura Saini¹, William Christenson¹, Paula Ludewig¹, Justin Staker¹ ¹University of Minnesota Medical School

146694 *Differences in glenohumeral joint contact forces between recovery hand patterns*

Shelby Walford

Shelby Walford¹, Jeffery Rankin², Richard Neptune¹ ¹University of Texas at Austin, ²Rancho Los Amigos National Rehabilitation Center

146710 Healthy Rotator Cuff Muscle Characteristics Across Age and Sex from Clinical MRI Scans

Lara Riem

Lara Riem¹, Matthew Cousins¹, Olivia DuCharme¹, Elizabeth Leitch², Mikalyn Defoor³, Andrew Sheean³, Brian Werner², Silvia Blemker⁴

¹Springbok Analytics, ²University of Virginia Medical School, ³Brooke Army Medical Center, ⁴University of Virginia

146758 Tenotomy and tenodesis surgically 'slacken' the biceps muscle: a simulation study

Jorie Budzikowski

Jorie Budzikowski¹, Gabriela Hernandez¹, Wendy Murray¹ ¹Northwestern University



BALANCE AND FALLS

Chairs: Brooke Odle, Kim Bigelow

146486 *Reduced Muscle Coordination Complexity Alters Walking Balance Control Across a Diverse Range of Perturbations in Older Adults*

Grant Maddox

Grant Maddox¹, Andrew Shelton², Vicki Mercer³, Jeremy Crenshaw⁴, Jason Franz², Jessica Allen¹ ¹University of Florida, ²University of North Carolina at Chapel Hill & North Carolina State University, ³North Carolina State University, ⁴University of Delaware

146719 *Neuromuscular Control of the Stance Limb is Related to Anterior Reactive Stepping Kinematics in Chronic Stroke*

Grace Kellaher

Grace Kellaher¹, Jamie Pigman², Darcy Reisman¹, Jeremy Crenshaw¹ ¹University of Delaware, ²Monmouth University

146820 Hop, skip, and a jump: investigating why people jump in response to walking perturbations

Jennifer Leestma

Jennifer Leestma¹, Vibha Iyer¹, Aaron Young¹, Gregory Sawicki¹ ¹Georgia Institute of Technology

146886 The relationship between deep brain stimulation and falls in parkinson's disease

Christopher Hurt

Christopher Hurt¹, Alyson Moll¹, Natasha Brooks¹, Daniel Kuhman¹, Harrison Walker¹ ¹University of Alabama at Birmingham

146804 Use of posturography increases balance-related diagnoses in physician clinic settings

Ajit Chaudhari

Ajit Chaudhari¹, Virginia Yazzie¹, Daniel Richie¹, Carmen Quatman¹, Jennifer Garvin¹ ¹The Ohio State University

146947 Inter-joint monosynaptic feedback reduces sensitivity to perturbation direction

Thendral Govindaraj

Thendral Govindaraj¹, Gregory Sawicki¹, T. Richard Nichols¹ ¹Georgia Institute of Technology



ASSISTIVE TECHNOLOGY

Chairs: Anne Martin, Collin Bowersock

146600 Shear wave tensiometry reveals individual adaptations to passive plantarflexor assistance during walking

Dylan Schmitz

Dylan Schmitz¹, Sara Harper¹, Alex Reiter¹, Darryl Thelen¹ ¹University of Wisconsin - Madison

146853 Interpreting common patient sensations to improve prosthesis prescription

Brittany Moores

Brittany Moores¹, Harrison Bartlett², Brian Lawson², Max Shepherd¹ ¹Northeastern University, ²Little Room Innovations

146717 Torso-dynamics Estimation System (TES) for hands-free ballbot navigation

Elizabeth Hsiao-Wecksler

Seung Yun Song¹, Nadja Marin¹, Chentai Yuan¹, Yixiang Guo¹, Chenzhang Xiao¹, Joao Ramos¹, Elizabeth Hsiao-Wecksler¹ ¹University of Illinois at Urbana-Champaign

146766 Effects of custom dynamic orthosis posterior strut stiffness on foot loading

Jason Wilken

Jason Wilken¹, Sara Magdziarz¹, Kirsten Anderson¹, Molly Pacha¹, Donald Anderson¹ ¹The University of Iowa

146770 User-adaptive walking speed estimation for scaling prosthetic assistance

Jairo Maldonado-Contreras

Aaron Young¹ ¹Georgia Institute of Technology

146961 Too much exoskeleton 'assistance' can disrupt user balance correction

Rish Rastogi

Rish Rastogi¹, Kristen Jakubowski¹, Owen Beck², Max Shepherd³, Giovanni Martino⁴, Gregory Sawicki⁵, Lena Ting¹

¹Emory University, ²University of Texas at Austin, ³Northeastern University, ⁴University of Padua, ⁵Georgia Institute of Technology



TENDON ADAPTATION AND INTERACTION

Chairs: Katie Knaus, Lauren Welte

146575 *Plantarflexor weakness and lesser achilles tendon stiffness associate with greater vulnerability to walking balance perturbations*

Ross Smith

Ross Smith¹, Andrew Shelton², Gregory Sawicki³, Jason Franz² ¹University of North Carolina, ²University of North Carolina at Chapel Hill & North Carolina State University, ³Georgia Institute of Technology

146670 The interactive effects of biological tendon and ankle exoskeleton stiffnesses on walking metabolic cost

Ricky Pimentel

Ricky Pimentel¹, Lindsey Trejo², Katherine Saul³, Gregory Sawicki², Jason Franz⁴ ¹University of North Carolina at Chapel Hill, ²Georgia Institute of Technology, ³North Carolina State University, ⁴University of North Carolina at Chapel Hill & North Carolina State University

146703 Tendon injury propagates from the enthesis-bone junction

Lilla Caton

Lilla Caton¹, Chris Curry¹, Coleman Cush¹, Sujata Khandare¹, Julianna Simon¹, Meghan Vidt² ¹Pennsylvania State University, ²Pennsylvania State University; Penn State College of Medicine

146747 Shear Wave Speeds Predict Fatigue-Induced Microdamage in Tendons

Jonathon Blank

Jonathon Blank¹, Soniya Patel¹, Darryl Thelen¹, Joshua Roth¹ ¹University of Wisconsin-Madison

146784 *Influence of preseason workloads on neuromuscular performance and patellar tendon properties in women collegiate volleyball athletes*

Brian Guthrie

Brian Guthrie¹, Erica King¹, Parag Chitnis¹, Siddhartha Sikdar¹, Qi Wei¹, Margaret Jones¹ ¹George Mason University

146860 Wearing high heels remodels leg muscle-tendons and improves walking economy

Owen Beck

Owen Beck¹, Jordyn Schroeder², Gregory Sawicki² ¹University of Texas at Austin, ²Georgia Institute of Technology



"REAL WORLD" BIOMECHANICS

Chairs: Eni Halilaj, Nataliya Rokhmanova

146231 *Estimating tendon load and walking speed using an instrumented immobilizing boot*

Michelle Kwon

Michelle Kwon¹, Todd Hullfish¹, Lorraine Boakye¹, Josh Baxter² ¹Perelman School of Medicine, University of Pennsylvania, ²University of Pennsylvania

146456 Matching step lengths & widths to the curvilinear paths we walk on

Jonathan Dingwell

Jonathan Dingwell¹, Anna Render¹, David Desmet¹, Jospeph Cusumano¹ ¹Pennsylvania State University

146721 Bilateral assessment of shoulder overuse in manual wheelchair users with spinal cord injury using IMU data during daily life

Omid Jahanian

Omid Jahanian¹, Meegan Van Straaten¹, Kathylee Pinnock Branford², Emma Fortune Ngufor¹, Stephen Cain², Melissa Morrow³

¹Mayo Clinic, ²West Virginia University, ³University of Texas Medical Branch

146691 Wearable estimates of patellar tendon loading while navigating outdoor terrains

Alex Reiter

Alex Reiter¹, Dylan Schmitz¹, Sara Harper¹, Yiteng Ma¹, Peter Adamczyk¹, Darryl Thelen¹ ¹University of Wisconsin-Madison

146463 Prediction of Medial Knee Joint Contact Force during Walking and Running using Custom Instrumented Insoles and Deep Learning in Young Healthy Female Individuals

Samantha Snyder

Samantha Snyder¹, Edward Chu¹, Yun Jung Heo², Ross Miller¹, Jae Kun Shim¹ ¹University of Maryland, ²Kyung Hee University

146892 Gait variability of real-world vs treadmill walking with bilateral robotic ankle exoskeletons with proportional myoelectric control

Rachel Hybart

Rachel Hybart¹, Daniel Ferris¹ ¹University of Florida



WOMEN'S HEALTH

Chair: Wendy Murray

146543 Sex Differences in Walking Biomechanics and Femoral Cartilage Properties in those with Anterior Cartilage Ligament Reconstruction

Jovanna Gallegos

Jovanna Gallegos¹, Isabella Balza¹, Steven Garcia¹, McKenzie White², Seth Kahan², Riann Palmieri-Smith¹ ¹University of Michigan, ²Orthopedic Rehabilitation and Biomechanics Laboratory

146523 *Characterizing the muscle activity of postpartum mothers during three infant lifting tasks*

Safeer Siddicky

Safeer Siddicky¹, Yuhang Cai², Yunsheng Zou², Kathryn Havens² ¹The University of Texas at Austin, ²University of Southern California

146563 *Carrying a bundle of joy: A comparative biomechanical analysis of infant transportation in mothers and non-mothers*

Kate Havens

Kathryn Havens¹, Sarah Goldrod², Erin Mannen² ¹University of Southern California, ²Boise State University

146693 Association of physical activity and body mass index with skeletal muscle mass index after menopause

Emma Fortune

Emma Fortune¹, Omid Jahanian¹, Stacey Winham¹, Ekta Kapoor¹, Walter Rocca¹, Nathan LeBrasseur¹, Kejal Kantarci¹, Melissa Morrow², Michelle Mielke³ ¹Mayo Clinic, ²University of Texas Medical Branch, ³Wake Forest University School of Medicine

146857 *Characterizing postural control dysfunction among breast cancer survivors with chemotherapy-induced neuropathy*

Lise Worthen-Chaudhari

Lise Worthen-Chaudhari¹, Patrick Schnell¹, Jacqueline Wilder¹, Courtney Bland¹, Kristen Lantis¹, Craig Vargo¹, Madeleine Hackney², Maryam Lustberg³

¹The Ohio State University, ²Emory University & Atlanta Veterans Affairs, ³Yale University



ANKLE MUSCLES AND PUSHOFF

Chair: Peter Adamczyk

146381 *Positive step length asymmetry during split-belt walking reduces joint work in older adults*

Russell Johnson

Russell Johnson¹, Tara Cornwell¹, Ryan Novotny¹, James Finley¹ ¹University of Southern California

146605 Age affects mechanical transmission between metatarsal phalangeal joint extension and plantarflexor muscle lengthening

Aubrey Gray

Aubrey Gray¹, Rebecca Krupenevich², Kota Takahashi³, Jason Franz⁴ ¹University of North Carolina/North Carolina State University, ²National Institutes of Health, ³University of Utah, ⁴University of North Carolina at Chapel Hill & North Carolina State University

146749 *Do Ankle Invertors and Evertors Contribute Substantially to Pushoff Power During* Gait?

Jack Martin

Jack Martin¹, Lauren Welte¹, Alex Reiter¹, Keith Knurr¹, Darryl Thelen¹ ¹University of Wisconsin-Madison

146611 The effects of age and task demand on dynamic mean ankle moment arm during walking

Aubrey Gray

Aubrey Gray¹, Peter Adamczyk², Jason Franz³ ¹University of North Carolina/North Carolina State University, ²University of Wisconsin-Madison, ³University of North Carolina at Chapel Hill & North Carolina State University

146877 Increased ankle pushoff alters frontal plane hip mechanics

Avery Kratzer

Avery Kratzer¹, Cara Lewis¹ ¹Boston Univerisity

146879 *Reliability of three extrapolation methods for ultrasound-based estimation of gastrocnemius fascicle lengths*

Logan

Faux-Dugan Logan Faux-Dugan¹, Stephen Piazza¹ ¹The Pennsylvania State University



HIP MECHANICS, DYSPLASIA, AND PAIN

Chairs: Michael Samaan, Erin Mannen

146414 Females with Hip Pain Display Decreased Kinetics at the Hip and Ankle During Gait

Madeline Grosklos

Madeline Grosklos¹, Cara Lewis², Elizabeth Ceballos¹, Jennifer Perry¹, Stephanie Di Stasi¹ ¹The Ohio State University, ²Boston University

146855 Hip moments differ by walking speed, but not group, in individuals with and without hip pain

Ria Rao

Ria Rao¹, Lauren Sara¹, Cara Lewis¹ ¹Boston University

146396 *Functional coverage following periacetabular osteotomy surgery for dysplastic hips*

Christina Bourantas

Christina Bourantas¹, John Clohisy¹, Michael Harris¹ ¹Washington University in St. Louis

146689 *Differences in middle-aged and young adults' hip joint quasi-stiffness during walking*

Allison Kinney

Shanpu Fang¹, Vinayak Vijayan¹, Megan Reissman¹, Allison Kinney¹, Timothy Reissman¹ ¹University of Dayton

146476 Hip Joint Forces During Gait Increase with Greater Iliopsoas Strength: A Simulation Study

Madeline Grosklos

Madeline Grosklos¹, Cara Lewis², Jay Patel¹, Jil Patel¹, Siddharth Fernandes¹, Jennifer Perry¹, Stephanie Di Stasi¹

¹The Ohio State University, ²Boston University

146405 Kinematics and kinetics during running in dysplastic hips

Molly Shepherd

Molly Shepherd¹, Michael Harris¹ ¹Washington University in St. Louis



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SPINE AND LOWER BACK

Chairs: Dennis Anderson, Courtney Butowicz

146566 Hip belts reduce lumbar spine compressive impulse when walking downhill

Jordan Sturdy

Jordan Sturdy¹, Hedaya Rizeq², Amy Silder², Pinata Sessoms², Anne Silverman¹ ¹Colorado School of Mines, ²Naval Health Research Center

146599 Chronic low back pain is associated with larger spinal compressive loads during walking with unilateral transtibial amputation

Courtney Butowicz

Courtney Butowicz¹, Pawel Golyski¹, Julian Acasio¹, Bradford Hendershot¹ ¹Extremity Trauma and Amputation Center of Excellence

146622 Disentangling the roles of pain and pain-related psychological factors in gait for chronic low back pain: a preliminary study

Anna Bailes

Anna Bailes¹, Gina McKernan¹, Carol Greco¹, Mark Redfern¹, Gwendolyn Sowa¹, Kevin Bell¹, Sara Piva¹, Jennifer Brach¹, Rakie Cham¹, LB3P Investigators¹ ¹University of Pittsburgh

146828 Divergence of trunk-hip movement control strategies in persistent low back pain

John Gilliam

John Gilliam¹, Ahyoung Song¹, Jennifer Vendemia¹, Sheri Silfies¹ ¹University of South Carolina

146843 The effect of serial ligament removal on the kinematic behavior of a functional unit spinal finite element model

Isaac Kumi

Isaac Kumi¹, Michael Polanco¹, Sebastian Bawab¹, Stacie Ringleb¹ ¹Old Dominion University

146850 Dynamic compliance vector: utility for quantifying spinal mechanics

Arin Ellingson

Matthew MacEwen¹, Rebecca Abbott¹, Victor Barocas¹, Arin Ellingson¹ ¹University of Minnesota



RUNNING INJURY

Chairs: Allison Gruber, Elizabeth Schmida

146430 Daily Running Consistency Reduces Odds of Running-Related Injury

Kiara Chan

Kiara Chan¹, Jennifer Sumner², Isaac Loegering², Jessica Thompson², Jeff Moreno³, Allison Gruber¹ ¹Indiana University, ²Brooks Sports, Inc., ³DashLX

146451 *Knee excursion is weakly associated with impact loads in running and loaded walking*

Torstein Daehlin

Torstein Daehlin¹, Caleb Johnson², Lauren Sara³, Stephen Foulis², Julie Hughes², Irene Davis¹ ¹University of South Florida, ²U.S. Army Research Institute of Environmental Medicine, ³Boston University

146581 *Effects of submaximal treadmill running on plantar fascia properties in resolved plantar fasciitis individuals*

Lukas Krumpl

Lukas Krumpl¹, Joshua Bailey¹ ¹University of Idaho

146604 Modulation of patellar tendon loading during running with real-time biofeedback

Elizabeth Schmida

Elizabeth Schmida¹, Sara Harper¹, Darryl Thelen¹ ¹University of Wisconsin-Madison

146787 Females with Low Back Pain Demonstrate Asymmetrical Shock Attenuation during Running

Joshua Winters

Joshua Winters¹, Tatiana Djafar¹, Nicholas Heebner¹, Alexa Johnson² ¹University of Kentucky, ²University of Michigan

146830 Are changes in running gait during a typical run associated with overuse injury?

James McDonnell

James McDonnell¹, Kathryn Davel¹, Kai Chien¹, Maxime Paquette², Allison Gruber¹ ¹Indiana University, ²University of Memphis



IMAGING FOR BONE AND JOINT HEALTH

Chairs: Don Anderson, Joshua Johnson

146273 *Effects of high glycation due to diabetes on fracture behavior of human cortical bone under dynamic loading*

Ahmad Najafi

Ebrahim Maghami¹, Ahmad Najafi¹ ¹Drexel University

146465 Thumb osteoarthritis progression is associated with decreases in carpometacarpal arthrokinematics and articular surface overlap

J.J. Trey Crisco

J.J. Trey Crisco¹, Amy Morton¹, Douglas Moore¹, Arnold-Peter Weiss¹, Amy Ladd¹ ¹Brown University

146608 Utilizing Weight Bearing CT to Evaluate PTOA Risk After ACL Reconstruction

Tyce Marquez

Tyce Marquez¹, Shannon Ortiz¹, Brian Wolf¹, Donald Anderson² ¹University of Iowa Orthopedics and Rehabilitation, ²The University of Iowa

146760 *Shape variation of the first metatarsal and implications for bone coordinate systems*

Eric Thorhauer

Eric Thorhauer¹, William Ledoux² ¹University of Washington, ²Veterans Affairs Puget Sound Healthcare & University of Washington

146803 Patellar shape strongly discriminates adult with recurrent patellar dislocation

Frances Sheehan

Paras Shah¹, Barry Boden², Frances Sheehan³ ¹The Cleveland Clinic, ²The Orthopaedic Center, ³The National Institutes of Health

146934 Characterization of unilateral SLIL injury using 4DCTmetrics

Erica Bell

Erica Bell¹, Cesar Lopez¹, Taylor Trentadue¹, Robert Foley¹, Shuai Leng¹, David Holmes III¹, Sanjeev Kakar¹, Steven Moran¹, Ryan Breighner², Andrew Thoreson¹, Kristin Zhao¹ ¹Mayo Clinic, ²Hospital for Special Surgery



EXOSKELETONS FOR ERGONOMICS

Chairs: Boyi Dai, Cameron Nurse

146363 The effect of an exosuit on trunk muscle activities during prolonged constructionrelated holding tasks

Yu Song

Yu Song¹, Haylen Cordova², Zhichen Feng¹, Ling Li¹, Maja Gor?i?³, Boyi Dai¹, Vesna Novak⁴ ¹University of Wyoming, ²University of Utah, ³University of Wisconsin- Milwaukee, ⁴University of Cincinnati

146385 *Effect of a back exosuit on lifting endurance and low back disorder risk factors*

Paul Slaughter

Paul Slaughter¹, Katherine Rodzak¹, Derek Wolf¹, Shimra Fine¹, Chad Ice¹, Karl Zelik¹ ¹Vanderbilt University

146407 Kinetic adaptations to restricting spine motion during lifting

Danielle Carnegie

Danielle Carnegie¹, Steven Hirsch¹, Samuel Howarth², Tyson Beach³ ¹University of Toronto, ²Canadian Memorial Chiropractic College, ³University of Waterloo

146453 Adverse effects of a passive leg-support exoskeleton on reactive balance after simulated slips and trips

Stephen Dooley Stephen Dooley¹, Sunwook Kim¹, Maury Nussbaum¹, Michael Madigan¹ ¹Virignia Tech

146715 Exoskeleton use on shoulder muscle activity in overhead-work with vibrations

Parisa Torkinejad Ziarati

Parisa Torkinejad Ziarati¹, Ting Xia¹, Simon Kudernatsch¹, Donald Peterson¹ ¹Northern Illinois University

146964 *Offsetting the load: Can exoskeletons mitigate injury risk during industrial lifting tasks?*

Felicia Davenport

Felicia Davenport¹, Jennifer Leestma¹, Christoph Nuesslein¹, Joshua Fernandez¹, Raymond Kim¹, Ryan Casey¹, Jason Wheeler², Anirban Mazumdar¹, Aaron Young¹, Gregory Sawicki¹ ¹Georgia Institute of Technology, ²Sandia National Laboratories



FOOT AND FOOTWEAR

Chairs: Erica Bell, Chris Wilburn

146152 The Relative Impact of Carbon Fiber Plates and Fit on Performance

Adam Luftglass

Adam Luftglass¹, Eric Honert¹, Daniel Feeney¹ ¹BOA Technology INC

146565 The Use of Heelless Technology Footwear as an Offloading Intervention

Robert Gregory Robert Gregory¹, Marc Robertson¹ ¹Southern Connecticut State University

146580 Medial longitudinal arch angle measured during walking gait using fluoroscopic radio-stereometric analysis shows differences between barefoot and shoed feet

Thomas Jenkyn

Thomas Jenkyn¹, Kristen Bushey¹, Emma Smart¹ ¹University of Western Ontario

146768 Does foot strike type influence cumulative load during running?

Sarah Ridge

Tamarie Trotter¹, Dustin Bruening¹, Joshua Sponbeck¹, Sarah Ridge² ¹Brigham Young University, ²University of Hartford

146924 A fresh technical look at foot posture vs dynamic foot function in healthy gait

Dustin Bruening

Dustin Bruening¹, Kirk Bassett¹, Sarah Ridge² ¹Brigham Young University, ²University of Hartford

146948 Foot power decreases with restricted first metatarsophalangeal joint range of motion

Adrienne Henderson

Adrienne Henderson¹, Lauren Williams², Dustin Bruening², Elisa Arch¹ ¹University of Delaware, ²Brigham Young University





HEAD IMPACT AND INJURY

Chairs: Jaclyn Caccese, Peter Fino

145964 The effect of concussion and anterior cruciate ligament injury history on thigh musculature motor control

April McPherson

April McPherson¹, Nathaniel Bates², Takashi Nagai³, Christopher Nagelli⁴, Nathan Schilaty⁵ ¹The Ohio State University & Emory Sports Performance And Research Center, ²The Ohio State University Wexner Medical Center, ³United States Army Research Institute of Environmental Medicine, ⁴Mayo Clinic, ⁵University of South Florida

146440 Bioinspired Horn Shaped Oscillators for Mitigating the Effects of Impact

Benjamin Wheatley

Jake Schaefer¹, Aaron Drake², Benjamin Wheatley¹ ¹Bucknell University, ²Function First Innovative Design, LLC

146645 A low-cost movement-based concussion diagnosis tool: preliminary results from a pilot study

Jacob Thomas Jacob Thomas¹, Rebecca Bliss¹, Trent Guess¹ ¹University of Missouri

146671 The effects of contact sport on cortical neurophysiology during cognitive-motor tasks

Samuel Zeff

Samuel Zeff¹, Richard van Emmerik¹, Douglas Martini¹ ¹University of Massachusetts Amherst

146738 Headform friction coefficients and implication on oblique helmet testing

Nicole Stark

Nicole Stark¹, Steve Rowson¹ ¹Virginia Tech Helmet Lab

146743 *Imu-Based Measures Of Stability Reveal Differences In Balance Performance Between Gymnasts With And Without A History Of Sport Related Concusion*

Daniel Duque Urrego

Daniel Duque Urrego¹, Kathylee Pinnock Brandford¹, Gerard Aristizábal Pla¹, Hunter Robinson¹, Hailee Settle¹, Kate Jochimsen¹, Stephen Cain¹ ¹West Virginia University



ACL RECONSTRUCTION AND OSTEOARTHRITIS

Chairs: Riann Palmieri-Smith, Alexa Johnson

146323 Evaluating gait symmetry 6 months after ACL reconstruction with quadriceps tendon autograft using wireless force sensing insoles in the clinical environment

Rachel Cherelstein

Rachel Cherelstein¹, Christopher Kuenze², Michelle Walaszek³, Emily Brumfield¹, Jennifer Lewis¹, Garrison Hughes¹, Edward Chang¹ ¹Inova Sports Medicine, ²University of Virginia, ³Inova Health University of Virginia

146539 Body mass index and walking biomechanics predict trochlear cartilage strain in individuals with anterior cruciate ligament reconstruction

Steven Garcia

Steven Garcia¹, McKenzie White¹, Seth Kahan¹, Jovanna Gallegos¹, Isabella Balza¹, Riann Palmieri-Smith¹ ¹University of Michigan

146574 The gait lab syndrome: how laboratory environments mask gait differences between healthy subjects and patients with anterior cruciate ligament reconstruction

Lauren Parola

Lauren Parola¹, Eni Halilaj¹ ¹Carnegie Mellon University

146662 *Multivariate time-series clustering identifies subgroups of individuals following ACL reconstruction based on midstance deficits*

Willa Ma

Willa Ma¹, Susan Sigward¹ ¹University of Southern California

146731 *Differences in Walking Biomechanicsand Cartilage Function During Sloped and Level Walking in Persons with Anterior Cruciate Ligament Reconstruction*

Isabella Balza

Isabella Balza¹, Jovanna Gallegos¹, Steven Garcia¹, Seth Kahan¹, McKenzie White¹, Riann Palmieri-Smith² ¹University of Michigan, ²The University of Michigan

146826 *Knee cartilage stress interlimb differences throughout gait 3 and 6 months after acl reconstruction: a finite element analysis*

Kelsey Neal

Kelsey Neal¹, Ashutosh Khandha¹, Lynn Snyder-Mackler¹, Thomas Buchanan¹ ¹University of Delaware



STROKE REHABILITATION AND GAIT

Chairs: Elisa Arch, Michael Lewek

146447 Experience with a cane impacts braking force during walking in post-stroke

Martins Amaechi

Martins Amaechi¹, Emily Steffensen², Oluwaseye Odanye², Lindsey Remski², Brian Knarr² ¹University of Nebraska, ²University of Nebraska Omaha

146510 Visuospatial cognition predicts biofeedback-driven locomotor performance in individuals post-stroke

Sarah Kettlety

Sarah Kettlety¹, Kristan Leech¹ ¹University of Southern California

146625 Individuals post-stroke do not self-optimize to novel afo use after one month

Jacob Skigen

Jacob Skigen¹, Corey Koller², Adrienne Henderson¹, Luke Nigro³, Elisa Arch¹ ¹University of Delaware, ²Memphis Grizzlies, ³University of Colorado-Boulder

146756 A New Way to Phase: Using Translational Kinematics To Estimate Paretic Limb Gait Phase

Austin Mituniewicz

Austin Mituniewicz¹, He (Helen) Huang², Michael Lewek³ ¹University of North Carolina at Chapel Hill & North Carolina State University, ²University of Central Florida, ³The University of North Carolina at Chapel Hill

146912 Anthropometric Deformities in Foot and Ankle Structure Among individuals with Chronic Stroke

Hogene Kim

Hogene Kim¹, Ji-Eun Cho¹, Kyeongjun Seo¹ ¹National Rehabilitation Center

146944 Does the relationship between whole-body angular momentum and step placement change in individuals post-stroke?

Jennifer Leestma

Jennifer Leestma¹, Gregory Sawicki¹, Aaron Young¹ ¹Georgia Institute of Technology



CLINICAL MOVEMENT DISORDERS

Chairs: Lise Worthen-Chaudhari, Kristen Renner

146109 *Comparing joint mechanics and muscle activity between level and incline walking in cerebral palsy*

Rosalind Franklin¹, Ying Fang¹, Zachary Lerner² University of Medicine and Science¹, Northern Arizona University²

146171 *Stability analysis for quantitative assessment of progressive supranuclear palsy affected gait*

Sandesh Bhat

Sandesh Bhat¹, Farwa Ali¹, Cecilia Hogen¹, Keith Josephs¹, Jennifer Whitwell¹, Kenton Kaufman¹ ¹Mayo Clinic

146448 Accelerometry-based analysis of postural sway in parkinson's disease patients with levodopa-induced dyskinesia

Carolin Curtze

Carolin Curtze¹, Chandler Brock¹, Joseph Aderonmu¹ ¹University of Nebraska at Omaha

146521 *Gait differences between clinical subtypes of Parkinson disease*

Sidney Baudendistel

Sidney Baudendistel¹, Allison Haussler¹, Kerri Rawson¹, Meghan Campbell¹, Gammon Earhart¹ ¹Washington University in St. Louis

146576 *Impact of a complex neuromotor impairment on locomotor control and executive function during treadmill walking*

Julia Manczurowsky

Julia Manczurowsky¹, Trevor Cline¹, Charles Hillman¹, Christopher Hasson¹ ¹Northeastern University

146881 *Rhythmic movement training improves spatiotemporal modulation of gait in older adults with and without mild cognitive impairment*

Meghan Kazanski

Meghan Kazanski¹, Michael Rosenberg¹, Laura Emmery², Trisha Kesar¹, Madeleine Hackney² ¹Emory University School of Medicine, ²Emory University & Atlanta Veterans Affairs



ERGONOMICS AND HUMAN FACTORS

Chairs: Michael Madigan, Youngjae Lee

146427 Evaluating Eye Drop Instillation Biomechanics With An Instrumented Bottle

Daniel Duque Urrego

Daniel Duque Urrego¹, Andrew Droste², Tanner Trenary², Alanson Sample², David Burke², Susan Brown², Paula Newman-Casey², Stephen Cain¹ ¹West Virginia University, ²University of Michigan

146483 Temporospatial gait parameters differ based on prolonged standing and knee pain

Abigail Schmitt

Abigail Schmitt¹, Ellie Mueller², Gary Austin¹, Kaitlin Gallagher¹ ¹University of Arkansas, ²New York Institute of Technology

146514 A Pilot Study Measuring Head Kinematics During Lab-Induced Ladder Falls

Gabrielle Ferro Gabrielle Ferro¹, Steve Rowson¹, Michael Madigan¹ ¹Virginia Tech

146556 *Impact of various occupational footwear on postural stability using balance tracking system*

Hunter Derby

Hunter Derby¹, Sachini Kodithuwakku Arachchige², Adam Knight¹, Harish Chander¹ ¹Mississippi State University, ²Weber State University

146798 The impact of various helmet loads on warfigther dismount strategies

Aidan Gross

Aidan Gross¹, Martin Fultot¹, Brian Higginson¹ ¹Galvion Ballistics Ltd.

146917 Influence of firefighter helmets on neck muscles fatigue

Felipe Santos

Felipe Santos¹, S Sudeesh¹, Suman Chowdhury¹ ¹Texas Tech University



SPORTS AND ATHLETES

Chairs: Glenn Fleisig, Kristin Morgan

146312 Kinematics Associated with Elbow Varus Torque in Baseball Pitchers

Glenn Fleisig

Glenn Fleisig¹, Thomas McCutcheon¹, Jonathan Slowik¹ ¹American Sports Medicine Institute

146377 Take-off technique is associated with peak spine extension in the back handspring step out on the balance beam

Gabriella Small Gabriella Small¹, Richard Neptune¹ ¹The University of Texas at Austin

146530 A need for speed: objectively identifying kinematic strategies associated with faster sprint velocities

Chris Vellucci Shawn Beaudette¹ ¹Brock University

146675 The Effects of Cheerleading Surfaces on Vertical and Flip Landing Mechanics

Anthony Nguyen

Anthony Nguyen¹, Brooke Slavens¹, Stephen Cobb¹, Kristian O'Connor¹ ¹University of Wisconsin-Milwaukee

146724 volumes relate to performance differently in collegiate soccer and basketball athletes

Matthew Cousins

Matthew Cousins¹, Olivia DuCharme¹, Vi Tran², Silvia Blemker², Joe Hart¹, Lara Riem¹ ¹Springbok Analytics, ²University of Virginia

146932 *Tibial accelerations, integrals, and symmetry via IMUs on various turf surfaces*

Joshua Lardie

Joshua Lardie¹, Rebecca Waite¹, Kyley Dickson¹, John Sorochan¹, Joshua Weinhandl¹ ¹University of Tennessee, Knoxville



Thematic Posters

COMPARATIVE AND ANIMAL BIOMECHANICS

Chair(s): Greg Sawicki, Chris Arellano

146499 *Kinematic analysis of live octopus: application to soft robotics and human biomechanics*

Garrett Weidig¹, Brittany Bush¹, Fermin Jimenez¹, Galit Pelled¹, Tamara Reid Bush¹ ¹Michigan State University

146690 Defining mammalian climbing gaits and their influential criteria

Cassandra Shriver

of Technology and Zoo Atlanta

Cassie Shriver¹, Andrew Schulz², Dylan Scott¹, Jennifer Elgart³, Joseph Mendelson III⁴, David Hu¹, Young-Hui Chang¹ ¹Georgia Institute of Technology, ²Max Planck Insitute for Intelligent Systems, ³Zoo Atlanta, ⁴Georgia Institute

146777 Alligators use elastic energy storage in ankle extensors during steady state walking

Adrien Arias

Adrien Arias¹, Elizabeth Mendoza¹, Emanuel Azizi¹ ¹University of California, Irvine

146805 Energy regulation in response to substrate energy loss

Brooke Christensen Brooke Christensen¹, Monica Daley¹ ¹University of California, Irvine

146914 Influence of knee morphology on the unipedal stance of flamingos

Young-Hui Chang Charles Hammer¹, Skylar Taylor¹, Young-Hui Chang¹ ¹Georgia Institute of Technology



LOWER LIMB LOSS AND PROSTHESES

Chairs: Karl Zelik, Cara Gonzalez

146167 *Does prosthetic foot type influence contralateral knee loads during walking among individuals with unilateral transtibial amputation?*

Pawel Golyski

Pawel Golyski¹, Jonathan Gladish¹, Jason Maikos², Bradford Hendershot¹ ¹Extremity Trauma and Amputation Center of Excellence, ²Veterans Affairs New York Harbor Healthcare System

146210 Persons with unilateral transtibial amputation experiencing intact limb joint pain exhibit asymmetric peak tibial acceleration during walking

Therese Parr

Therese Parr¹, Shawn Farrokhi¹, Bradford Hendershot¹, Courtney Butowicz¹ ¹Extremity Trauma and Amputation Center of Excellence

146491 The effect of different combinations of passive-mechanical prosthetic knee and ankle-foot components on gait safety in transfemoral prosthesis users

Miguel Vaca

Miguel Vaca¹, Rebecca Stine², Matthew Major¹, Steven Gard¹ ¹Northwestern Unviersity, ²Jesse Brown Veterans Affairs Medical Center

146601 Gait smoothness as a measure of movement quality after lower limb loss

Courtney Butowicz

Courtney Butowicz¹, Julian Acasio¹, Bradford Hendershot¹ ¹Extremity Trauma and Amputation Center of Excellence

146695 A robotic emulator for exploring transtibial biarticular prosthesis designs

Anthony Anderson

Anthony Anderson¹, Kira Gauthier², Mathew Sunil Varre², Kimberly Nickerson², Brittney Muir¹, Patrick Aubin¹ ¹University of Washington, ²University of Washington & Veterans Affairs Center for Limb Loss and Mobility

146702 Biomechanical Disadvantage of Amputated Limb Gluteus Medius in Patients with Unilateral Transfemoral Amputation

Galen Roda

Galen Roda¹, Mohamed Awad², Danielle Melton³, Cory Christiansen², Jason Stoneback², Brecca Gaffney¹ ¹University of Colorado Denver, ²University of Colorado - Anschutz Medical Campus, ³University of Colorado Anschutz

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BALANCE IN GAIT

Chairs: Jeremy Crenshaw, Jenny Kent

146561 The influence of step width on individual muscle contributions to frontal-plane balance control

Lindsey Molina

Lindsey Molina¹, Richard Neptune² ¹Exponent, Inc., ²The University of Texas at Austin

146699 Directional Asymmetries in Stability-Maneuverability Trade-Offs During Walking

Rucha Kulkarni

Rucha Kulkarni¹, Francis Grover¹, Anna Shafer², Xenia Schmitz¹, Keith Gordon¹ ¹Northwestern University, ²Edward Hines Jr. VA Hospital

146716 *High Functioning Older Adults Can Increase Balance Regulation During Fast Walking*

Sarah Roelker

Sarah Roelker¹, Athulya Simon¹, Katherine Boyer¹ ¹University of Massachusetts Amherst

146734 *Can minimum toe clearance predict community-based, trip-related stumbles by older adults?*

Marco Avalos

Marco Avalos¹, Noah Rosenblatt¹ ¹Rosalind Franklin University of Medicine and Science

146774 How healthy older adults maintain lateral balance on narrowing walking paths

Meghan Kazanski

Meghan Kazanski¹, Joseph Cusumani², Jonathan Dingwell² ¹Emory University School of Medicine, ²Pennsylvania State University

146911 Parallel learning and retention of balance control strategies while walking through a novel viscous force field

Francis Grover

Francis Grover¹, Anna Shafer², Keith Gordon¹ ¹Northwestern University Feinberg School of Medicine, ²Edward Hines Jr. VA Hospital



MOBILITY WITH LOWER LIMB EXOSKELETONS

Chairs: Dan Ferris, Jennifer Leetsma

146344 Step width and step length response to active abduction/adduction assistance provided by powered hip exoskeleton

Abbas Alili

Abbas Alili¹, Aaron Fleming¹, Varun Nalam¹, He (Helen) Huang² ¹North Carolina State University, ²University of Central Florida

146389 Joint kinematics and ground reaction forces from spinal cord injured and ablebodied participants walking in a self-balancing exoskeleton

Gabriela De Carvalho

Gabriela de Carvalho¹, Vishnu Chandran², Ann Spungen³, Saikat Pal¹ ¹New Jersey Institute of Technology, ²Hospital for Special Surgery, ³James J. Peters Veterans Affairs Medical Center

146528 *Optimizing exoskeleton assistance to improve walking speed and energy economy for older adults*

Ava Lakmazaheri

Ava Lakmazaheri¹, Seungmoon Song², Brian Vuong¹, Blake Biskner¹, Deborah Kado¹, Steven Collins¹ ¹Stanford University, ²Northeastern University

146585 An Implantable Actuator for Muscle Force Assistance in a Bipedal Animal Model

Sean Thomas

Sean Thomas¹, Ravin Joshi¹, Bo Cheng¹, Huanyu Cheng¹, Michael Aynardi¹, Gregory Sawicki², Jonas Rubenson¹

¹The Pennsylvania State University, ²Georgia Institute of Technology

146849 Enhancing Human Navigation Ability Using an Active Wearable Exoskeleton

Carlos Carrasquillo

Carlos Carrasquillo¹, Aakash Bajpai¹, Divya Iyengar¹, Killian Young¹, Aaron Young¹, Anirban Mazumdar¹ ¹Georgia Institute of Technology

146955 Elastic exoskeleton influence on muscle spindle firing in-vivo

Amro Alshareef

Amro Alshareef¹, Paul Nardelli¹, Tim Cope¹, Lena Ting¹, Gregory Sawicki¹ ¹Georgia Institute of Technology



RUNNING PERFORMANCE

Chairs: Patrick Corrigan, Zoey Kearns

146220 *Effects of fatigue on lower-limb coordination and coordination variability during running in highly trained endurance runners*

Yiyang Chen

Yiyang Chen¹, Gleydciane Fernandes¹, Henri Lajeunesse¹, Isabella Sierra¹, Caroline Paquette¹, Julie Côté¹ ¹McGill University

146243 Longitudinal changes in collegiate runner biomechanics.

Elizabeth Schmida

Elizabeth Schmida¹, Mikel Stiffler-Joachim¹, Bryan Heiderscheit¹ ¹University of Wisconsin-Madison

146495 Increased hamstring stretch and stretch rate in accelerative vs constant speed running

Reed Gurchiek

Reed Gurchiek¹, Zachary Teplin¹, Jennifer Hicks¹, Scott Delp¹ ¹Stanford University

146727 Body weight support decouples the biomechanical and physiological determinants of exercise tolerance during human running

Shernice Thomas Shernice Thomas¹, Franciso Espinoza¹, Christopher Arellano¹ ¹University of Houston

146800 Musculoskeletal specialization for sprinting and marathon running

Tom Van Wouwe Tom Van Wouwe¹, Jennifer Hicks¹, Scott Delp¹, Karen Liu¹ ¹Stanford University





VALIDITY OF MARKERLESS MOTION CAPTURE

Chairs: Josh Baxter, Scott Uhlrich

146149 Markerless motion capture and biomechanical analysis pipeline for rehabilitation

R. James Cotton

R. James Cotton¹ ¹Shirley Ryan AbilityLab / Northwestern University

146174 *Markerless motion capture estimates of lower extremity biomechanics are comparable to marker-based across 8 movements*

Ke Song

Ke Song¹, Todd Hullfish¹, Rodrigo Scattone Silva², Karin Silbernagel³, Josh Baxter¹ ¹University of Pennsylvania, ²Federal University of Rio Grande do Norte, ³University of Delaware

146644 Validity of spine loading assessed using markerless video-based 3D motion analysis

Dennis Anderson

Andrew Lynch¹, Jacob Banks², Joanna James¹, Andrew White², Dennis Anderson³ ¹Beth Israel Deaconess Medical Center, ²Beth Israel Deaconess Medical Center / Harvard Medical School, ³The University of Tennessee at Knoxville

146648 Validation of a markerless motion capture system in the presence of an orthopaedic knee brace

Joshua Taylor Joshua Taylor¹, Ikeade Adeyinka¹, Timothy Burkhart¹ ¹University of Toronto

146679 Comparison of gait deviation index(GDI) measured by marker-based and markerless motion capture systems in children with cerebral palsy (CP)

Jutharat Poomulna

Jutharat Poomulna¹, Brian Knarr¹, Vivek Dutt², David Kingston¹ ¹University of Nebraska at Omaha, ²University of Nebraska Medical Center

146683 Clinical use of markerless motion capture in patients recovering from ACLR

Devin Kelly

Devin Kelly¹, Adam Kiefer¹, Robin Queen², Gabrielle DelBiondo¹, Joe Hart¹ ¹University of North Carolina at Chapel Hill, ²Virginia Tech



LANDING AND ACL INJURY

Chairs: Robin Queen, Katie Collins

145956 Female athlete joint coordination is unstable during the eccentric phase of a jump landing

Kayla Kowalczyk

Kayla Kowalczyk¹, Eric Shumski¹, Robert Lynall¹ ¹University of Georgia

146135 *Effects of vision and knowledge of landing conditions on pre-landing and early landing mechanics associated with ACL loading*

Ling Li

Ling Li¹, Yu Song¹, Peyton Hatcher¹, Raychl Fairbanks¹, Boyi Dai¹ ¹University of Wyoming

146417 *Cognitive-motor function during jump landings following anterior cruciate ligament reconstruction*

Fatemeh Aflatounian

Fatemeh Aflatounian¹, Ezekiel Barden¹, James Becker¹, Keith Hutchison¹, Janet Simon², Dustin Grooms², Scott Monfort¹

¹Montana State University, ²Ohio University

146484 Relationships between patient-reported outcomes and biomechanical predictors of second ACL injuries during unanticipated jump landings

Scott Monfort

Scott Monfort¹, Fatemeh Aflatounian¹, Ezekiel Barden¹, Patrick Fischer¹, James Becker¹, Keith Hutchison¹, Janet Simon², Dustin Grooms² ¹Montana State University, ²Ohio University

146775 Hop Distance Limb Symmetry Reflects Landing Knee Kinematic Symmetry

Kayla Seymore

Stefano Di Paolo¹, Naoaki Ito², Kayla Seymore², Laura Bragonzoni¹, Stefano Zaffagnini³, Lynn Snyder-Mackler², Karin Grävare Silbernagel² ¹University of Bologna, ²University of Delaware, ³IRCCS Rizzoli Orthopaedic Institute

146840 The impact of sex and varying horizontal approach on limb stiffness and limb stiffness at limb

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Michael Teater

Michael Teater¹, Daniel Schmitt², Robin Queen¹ ¹Virginia Tech, ²Duke University



AGING AND MOBILITY

Chairs: Sarah Roelker, Ricky Pimentel

145976 Biomechanical responses of older ballet dancers following standing slips

Caroline Simpkins

Caroline Simpkins¹, Jiyun Ahn¹, Sangwon Shin¹, Sara Mahmoudzadeh Khalili¹, Feng Yang¹ ¹Georgia State University

146254 Anticipatory synergy adjustment during curb descent in healthy older adults

Ashwini Kulkarni

Chuyi Cui¹, Ashwini Kulkarni¹, Shirley Rietdyk¹, Satyajit Ambike¹ ¹Purdue University

146357 *Changes in multi-muscle coordination during a 30-minute walk differ by fatigability*

Jocelyn Hafer

Jocelyn Hafer¹, Sarah Roelker², Katherine Boyer² ¹University of Delaware, ²University of Massachusetts Amherst

146490 Older adults use a more cautious strategy to navigate turns while walking

Andrew Shelton

Kevin Lima¹, Andrew Shelton¹, Jessica Allen², Vicki Mercer³, Jason Franz¹ ¹University of North Carolina at Chapel Hill & North Carolina State University, ²University of Florida, ³University of North Carolina at Chapel Hill

146534 Surface, but not age impact lower limb joint work during walk and stair ascent

Thomas Wenzel

Thomas Wenzel¹, Nicholas Hunt¹, Amy Holcomb¹, Clare Fitzpatrick¹, Tyler Brown¹ ¹Boise State University

146553 Young adults accelerate their arms significantly faster than older adults in response to a slip perturbation

Jonathan Lee-Confer

Jonathan Lee-Confer¹, Matthew Lo², Karen Troy³ ¹Verum Biomechanics, ²University of California, Irvine, ³Worcester Polytechnic Institute



Poster Listings

SESSION 1 Wednesday, August 9 17:30 - 19:30

SESSION 2 Thursday, August 10 16:00 - 18:00

POSTER SESSION 1

Wednesday, August 9, 2023

P1-1 145546 Evaluation of performance of type I construction helmets based on different standardized tests

John Wu¹, John Wu¹, Christopher Pan¹, Mahmood Ronaghi¹, Bryan Wimer¹

¹Centers for Disease Control and Prevention

P1-2 145590 How to implement wearable ultrasound for prosthetic hand control

Samuel Acuña¹, Ahmed Bashatah¹, Siddhartha Sikdar¹ ¹George Mason University

P1-3 145605 An investigation into seasonal changes of power and fatigue in collegiate baseball pitchers

Suzanne Konz¹, Chris Lapole¹, Brandi Anders¹ ¹Marshall University

P1-4 145644 *Comparison of two foam surfaces on posturography outcomes*

Kimberly Bigelow¹, Ajit Chaudhari², Daniel Merfeld² ¹University of Dayton, ²The Ohio State University

P1-5 145877 The influence of stochastic vibratory stimulation on balance recovery

Karam Elali¹ ¹University of Arizona

P1-6 145945 Stochastic resonance influences heaviness perception

Alli Grunkemeyer¹, Aaron Likens¹ ¹University of Nebraska at Omaha

P1-7 145952 *Reproducibility of gaze and movement assessment of upper limb function*

Samuel Acuña¹, Maddie Krotine¹, Gabriel Gibson¹, Quinn Boser², Jacqueline Hebert², Siddhartha Sikdar¹ ¹George Mason University, ²University of Alberta

P1-9 145999 *Does step descent while wearing a mask influence muscle activity?*

Kaitlin Kremski¹, Emily Gerstle¹

¹University of Scranton

P1-10 146006 Screening cognitive decline: multiscale entropy analysis during dual-tasking using functional near infrared spectroscopy measurements

Kelsi Petrillo¹, Hector Flores¹, Isabellah Mayoral-Ortega¹, Bilaval Javed¹, Meenakshi Dagar², Nima Toosizadeh¹

¹University of Arizona, ²Banner Health

P1-11 146020 *Effect of waist vibrotactile feedback on postural balance under dynamically challenging environments*

Soubhagya Nayak¹, Kwanghee Jo¹, Anvitha Doddipalli¹, Soe Lin Paing¹, Hyunglae Lee¹ ¹Arizona State University

P1-12 146108 *Modelling occupant head accelerations during far-side lateral impacts*

Minori Iizuka¹, Sean Shimada¹ ¹Biomechanical Consultants

P1-13 146114 Single-leg backward hopping can better detect quadriceps strength deficits induced by a fatigue protocol compared to forward and vertical hopping

Yu Song¹, Lauren Salsgiver¹, Kaden Van Valkenburg¹, Natalie Christofferson¹, Yessica Lo¹, Brenna McGuinness², Boyi Dai¹ ¹University of Wyoming, ²University of Montana

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P1-14 146130 An occupant head acceleration model during near-side lateral impacts

Minori Iizuka¹, Sean Shimada¹ ¹Biomechanical Consultants

P1-15 146131 *Quantifying the effects of perturbation intensity on slip outcome in young adults*

Sangwon Shin¹, Jiyun Ahn¹, Caroline Simpkins¹, Diane Brown¹, Laura Wentworth¹, Feng Yang¹ ¹Georgia State University

P1-16 146147 Evaluating the effectiveness of neuromuscular training to reduce lower extremity injury risk in athletes with a history of concussion

April McPherson¹, Taylor Zuleger¹, Kim Barber Foss¹, Jed Diekfuss¹, Greg Myer¹

¹Emory Sports Performance And Research Center

P1-17 146148 *Fatigability and physical activity level in middle-aged adults with obesity*

Julie Rekant¹, Zachary Wilson¹, April Chambers¹ ¹University of Pittsburgh

P1-18 146150 Evaluation of a pneumatic cylinder for actuating an ankle exoskeleton

David Bell¹, Michael Zabala¹ ¹Auburn University

P1-19 146153 The effect of using an extension arm nail gun attachment on maximum knee joint loading during a simulated sloped shingle installation task

Kevin Moore¹, John Wu¹, Robert Carey¹, Scott Breloff² ¹NIOSH/HELD/PERB, ²NIOSH

P1-20 146154 *Comparison of fall prevalence between Alzheimer's disease and mild cognitive impairment in older adults: a meta-analysis*

Sara Mahmoudzadeh Khalili¹, Caroline Simpkins¹, Debra Tann¹, Feng Yang¹ ¹Georgia State University

P1-22 146160 Just noticeable difference of impedance parameters while walking in an ankle exoskeleton

Axl Maberry¹, Anne Martin¹ ¹The Pennsylvania State University

P1-23 146161 In vivo cervical facet capsular ligament mechanics: estimations based on subject-specific anatomy and kinematics

Maryam Nikpasand¹, Rebecca Abbott¹, Craig Kage¹, Sagar Singh², Beth Winkelstein², Victor Barocas¹, Arin Ellingson¹

¹University of Minnesota, ²University of Pennsylvania

P1-24 146163 Biodex postural stability test scores in collegiate students

Ben Meyer¹ ¹Shippensburg University

P1-25 146164 *Muscle coactivation during gait in children with cerebral palsy*

Patrick Ippersiel¹, Cloé Dussault-Picard¹, Sahar Gharenbolagh¹, Gabriela De Carvalho², Vishnu Chandran², Saikat Pal², Philippe Dixon¹

¹University of Montreal, ²New Jersey Institute of Technology

P1-26 146172 *Predicting postural stability from skin temperature after cold-water immersion in field conditions*

Amy Silder¹, Rebecca Weller¹, Rebecca McClintock¹, Timothy Dunn¹, Pinata Sessoms¹, Douglas Jones¹ ¹Naval Health Research Center

P1-27 146173 Foot and shoe kinetics across running grades and footwear uppers

Eric Honert¹, Milena Singletary¹, Kathryn Harrison¹, Daniel Feeney¹ ¹BOA Technology INC

¹BOA Technology INC

P1-28 146176 Using a single inertial measurement unit to relate Y-balance reach distance to movement complexity in U.S. marines

Amy Silder¹, Brian Green¹, Nicole Heimark¹, Danielle Torp², Pinata Sessoms¹, John Fraser¹, Matthew Hoch² ¹Naval Health Research Center, ²University of Kentucky

P1-29 146177 *Muscle-driven endoprosthetic limbs: rationale, feasibility, and challenges*

Dustin Crouch¹, David Anderson², Stacy Stephenson², Cheryl Greenacre², Katrina Easton¹, Patrick Hall¹, Caleb Stubbs¹, Obinna Fidelis¹, Morteza Asgari¹, Bryce Burton¹, Rebecca Rifkin¹, Remi Grzeskowiak¹, Alisha Pedersen¹, Caroline Billings¹, Kristin Bowers¹

¹University of Tennessee, Knoxville
P1-30 146184 Al systems for improving biomechanics of the mobility impaired with wearable robots

Aaron Young¹, Krishan Bhakta¹, Inseung Kang² ¹Georgia Tech, ²MIT

P1-31 146186 An initial set of reference values for the balance tracking system (BTracks) limits of stability protocol based on 800 healthy young adults

Nathan Conner¹, Michael Nolff², Shweta Kapur², Daniel Goble², Adam Knight¹, Harish Chander¹

¹Mississippi State University, ²Oakland University

P1-32 146188 *Differences of neck musculature motor unit control between concussed and controls*

Nathan Schilaty¹, Takashi Nagai², April McPherson³, Nathaniel Bates³

¹University of South Florida, ²USARIEM, ³Ohio State University

P1-33 146189 Dependence of total ankle tibial component stability upon bone density

Gabriel Clarke¹, Joshua Johnson¹, Cesar de Cesar Netto¹, Donald Anderson¹

¹University of Iowa

P1-34 146191 *Perturbation-based training on compliant surfaces to enhance postural balance in people with neurological disorders using a twin dual-axis robotic platform*

Connor Phillips¹, Vu Phan¹, Kwanghee Jo¹, Omik Save¹, Joshua Russell¹, Kayla Zeien¹, Megan Eikenberry², Carolyn Kinney³, Hyunglae Lee¹ ¹Arizona State University, ²Midwestern University, ³Mayo Clinic

P1-35 146192 A twin dual-axis robotic platform for the quantification of bilateral ankle impedance

Connor Phillips¹, Joshua Russell¹, Matthew Auer¹, Vu Phan¹, Kwanghee Jo¹, Omik Save¹, Varun Nalam¹, Hyunglae Lee¹

¹Arizona State University

P1-36 146203 Ankle stress analysis for beginner performing the asymmetric and symmetric dumbbell farmer's walk exercise

Joyce Blandino¹, Stephen Castle¹, Michael Krackow¹ ¹Virginia Military Institute

P1-37 146209 Changes to muscle fiber morphology and fibrosis following brachial plexus birth injury

Kyla Bosh¹, Brooke Dunley¹, Katherine Saul², Jacqueline Cole¹

¹North Carolina State University; University of North Carolina, ²North Carolina State University

P1-38 146215 Factors associated with falls in older adults: secondary analysis of a 12-month rct

Katherine Hsieh¹, Jamie Speiser², Rebecca Neiberg², Antony Marsh³, Janet Tooze², Denise Houston²

¹Wake Forest School of Medicine, ²Wake Forest University School of Medicine, ³Wake Forest University

P1-40 146222 Introducing biomechanics in an undergraduate mechanism design course: a case study

Michael Potter¹

¹Francis Marion University

P1-41 146224 Error-state Kalman filter for joint center estimation from adjacent-limb IMU data

Michael Potter¹, Stephen Cain², Lauro Ojeda³, Reed Gurchiek⁴, Ryan McGinnis⁵

¹Francis Marion University, ²West Virginia University, ³University of Michigan, ⁴Stanford University, ⁵University of Vermont

P1-42 146225 Fit features of hike boots and their effects on walking biomechanics

Milena Singletary¹, Daniel Feeney¹, Eric Honert¹ ¹BOA Technology Inc.

P2-480 146228 Adverse impacts of parkinson's disease and dual-tasking on the temporal and control aspects of balance interpreted by directional virtual time-to-contact

Vu Phan¹, Daniel Peterson², Hyunglae Lee² ¹Arizona State University, ²Carnegie Mellon University

P1-44 146230 EMG informed musculoskeletal modelling and deep learning to estimate muscle moment

Ethan Schonhaut¹, Dean Molinaro¹, Keaton Scherpereel¹, Aaron Young¹

¹Georgia Institute of Technology

P1-45 146232 Segment stabalization for SAM and fastcast splinting of complete tibia-fibula fractures

Nathaniel Bates¹, Grace Hobayan¹, John Heyniger¹, Kenan Alzouhayli¹, Franco Piscitani¹, Clifton Haider², Christopher Felton², Adam Groth¹, Kevin Martin¹

¹The Ohio State University Wexner Medical Center, ²Mayo Clinic

P1-46 146233 *Thigh musculature motor control after multiple anterior cruciate ligament injuries*

Nathaniel Bates¹, April McPherson¹, Christopher Nagelli², Takashi Nagai³, Nathan Schilaty⁴ ¹The Ohio State University Wexner Medical Center, ²Mayo Clinic, ³United States Army, ⁴University of South

P1-47 146234 Hand-specific specialization of grip force control during bimanual prehension

Anvesh Naik¹, Satyajit Ambike¹ ¹Purdue University

P1-48 146245 Uncontrolled manifold analysis of haptic feedback during quiet standing

Frankie Alcalá¹, Cara Painter¹, Andrew Meszaros¹, Kayt Frisch¹

¹George Fox University

Florida

P1-49 146246 The effect of asymmetric and symmetric loading on hip and lateral trunk sway while performing the dumbbell farmer's walk exercise

Michael Krackow¹, Joyce Blandino¹ ¹Virginia Military Institute

P1-50 146247 Increased instability during walking for individuals with Parkinson's disease is related to a loss of upper body and head control

Paphawee Prupetkaew¹, Steven Morrison¹ ¹Old Dominion University

P1-51 146250 Vertical ground reaction force symmetry during a drop vertical jump task is associated with patient-reported function after anterior cruciate ligament reconstruction

Michelle Walaszek¹, Katherine Collins², Francesca Genoese², Elaine Reiche³, Shelby Baez³, Matthew Harkey², Christopher Kuenze¹

¹University of Virginia, ²Michigan State University, ³University of North Carolina - Chapel Hill

P1-52 146252 Anticipatory synergy adjustment during finger force production scales in go-no-go tasks

Anvesh Naik¹, Ruchika Iqbal¹, Satyajit Ambike¹ ¹Purdue University

P1-53 146253 *IMU-based 3D shoulder and elbow joint angle estimation during badminton, golf, dance, yoga, and swimming*

Kezhe Zhu¹, Jinxuan Li¹, Peter Shull¹ ¹Shanghai Jiao Tong University

P1-54 146256 Activity recognition improves lower-limb kinematics prediction using a reduced IMU sensor configuration

Jinxuan Li¹, Kezhe Zhu¹, Peiqi Kang¹, Peter Shull¹ ¹Shanghai Jiao Tong University

P1-55 146260 What you need to know about exercise monitoring with inertial sensing wearables

Vu Phan¹, Ke Song², Rodrigo Scattone Silva³, Karin Silbernagel³, Josh Baxter², Eni Halilaj¹

¹Carnegie Mellon University, ²University of Pennsylvania, ³University of Delaware

P1-57 146267 Exploring associations between gait kinematics-based classification of knee osteoarthritis patients and clinical/radiographic features: insights from a biomechanical study

Felipe Gonzalez¹, Gustavo Leporace², Carlos Franciozi³, Leonardo Metsavaht², Felipe Carpes⁴, Jorge Chahla¹, Marcus Luzo³

¹Midwest Orthopaedics at Rush, ²IBTS (Instituto Brasil de Tecnologias da Saúde), ³Federal University of São Paulo (UNIFESP), ⁴Federal University of Pampa



P1-58 146268 Grasp training after spinal cord injury using augmented feedback in mixed-mode reality

Mingxiao Liu¹, Samuel Wilder¹, Sean Sanford¹, Sophie Dewil¹, Noam Harel², Raviraj Nataraj¹

¹Stevens Institute of Technology, ²James J. Peters VA Medical Center

P1-59 146274 Validating inertial measurement units for measuring trunk kinematics during over-ground trips

Youngjae Lee¹, Neil Alexander², Christopher Franck¹, Michael Madigan¹

¹Virginia Tech, ²University of Michigan

P1-60 146277 Human activity recognition based on deep learning model

Bummo Koo¹, Seunghee Lee¹, Sumin Yang¹, Dongkwon Kim¹, Youngho Kim¹ ¹Yonsei University

P1-61 146279 Deep learning based fall risk prediction using data augmentation

Seunghee Lee¹, Bummo Koo¹, Sumin Yang¹, Dongkwon Kim¹, Youngho Kim¹

¹Yonsei University

P1-62 146294 Influence of gait retraining on running speed and mechanics following musculoskeletal injury in military personnel

Nicholas Reilly¹, Amy Weart¹, Erin Miller², Paige McHenry², Maria Gonnella¹, Henry Haltiwanger³, Kevin Ford⁴, Michael Crowell², Donald Goss⁴

¹Geneva Foundation, ²Keller Army Community Hospital, ³Womack Army Medical Center, ⁴High Point University

P1-63 146297 Do individuals with lower limb osteoarthritis redistribute propulsion proximally?

Francesca Wade¹, Chun-Hao Huang², Burcu Aydemir³, Kharma Foucher¹

¹University of Illinois at Chicago, ²Northeastern University, ³Northwestern University Feinberg School of Medicine

P1-65 146303 Validating inertial measurement units for measuring slipping foot kinematics during over-ground slips

Michelle Morris¹, Youngjae Lee¹, Neil Alexander², Christopher Franck¹, Michael Madigan¹ ¹Virginia Tech, ²University of Michigan

P1-67 146307 Do biomechanists represent the general population? An investigation of selection bias and hand function

Maximillian Diaz¹, Joel Harley¹, Jennifer Nichols¹ ¹Univeristy of Florida

P1-68 146308 Neural responses during a force-control motor task with altered visual feedback

Sophie Dewil¹, Mingxiao Liu¹, Sean Sanford¹, Raviraj Nataraj¹

¹Stevens Institute of Technology

P1-69 146309 *Muscle activation during aquatic treadmill walking in children with cerebral palsy: preliminary evidence*

Joseph Harrington¹, Brian Knarr¹, Vivek Dutt², David Kingston¹

¹University of Nebraska at Omaha, ²University of Nebraska Medical Center

P1-70 146311 *Peak minute-level free-living cadence is associated with laboratory gait speed and vertical ground reaction forces following anterior cruciate ligament reconstruction*

Katherine Collins¹, Caroline Lisee², Matthew Harkey¹, Dante Goss³, Karin Pfeiffer¹, Jeemin Kim¹, Christopher Kuenze³

¹Michigan State University, ²University of North Carolina at Chapel Hill, ³University of Virginia

P1-71 146317 A kinematics-based approach to future joint angle prediction

Ryan Pollard¹, David Hollinger¹, Michael Zabala¹ ¹Auburn University

P1-72 146318 *Does altering PD-AFO stiffness affect ankle mechanics in individuals post-stroke: a pilot study*

Shay Pinhey¹, Jacob Skigen¹, Zahra McKee¹, Elisa Arch¹

¹University of Delaware



P1-73 146322 Smartphone and paper based delivery of balance intervention for older adults is equally effective, enjoyable, and of high fidelity

Vipul Lugade¹, Molly Torbitt¹, Suzanne O'Brien¹, Patima Silsupadol¹

¹Binghamton University

P1-75 146328 External forces during the American rumba box step across three dance levels

Meredith Wells¹, Feng Yang² ¹Emory University, ²Georgia State University

P1-76 146332 Balance control during beam walking is not predictive of back handspring balance control and performance on the balance beam

Gabriella Small¹, Richard Neptune¹ ¹The University of Texas at Austin

P1-77 146335 Improving data efficiency and accuracy of imu-driven biomechanical assessment via self-supervised learning

Tian Tan¹, Peter Shull², Akshay Chaudhari¹

¹Stanford, ²Shanghai Jiao Tong University

P1-78 146337 The association between grip strength and upper body power in U.S. marine infantry

Amy Silder¹, Douglas Jones¹, Pinata Sessoms¹, Rebecca Zifchock², Robert Murphy²

¹Naval Health Research Center, ²United States Military Academy

P1-79 146339 Assessing test-retest reliability of nonlinear dynamic outcomes from functional near-infrared spectroscopy brain measurement

Hector Flores¹, Isabellah Mayoral Ortega¹, Kelsi Petrillo¹, Bilaval Javed¹, Nima Toosizadeh²

¹The University of Arizona, ²Student

P1-80 146346 Application of machine learning algorithms to predict elbow biomechanical efficiency

Richard Boergers¹, Manfred Minimair¹, Michael Ciminiello¹, Emily Giannini¹, Natasha Rose¹, Zachary Sylvester¹, Anthony Vischovich¹

¹Seton Hall University

P1-81 146350 Knee symptoms are not associated with free-living cadence among adolescents with anterior cruciate ligament reconstruction

Christopher Kuenze¹, Katherine Collins², Dante Goss¹, Karin Pfeiffer², Michelle Walaszek¹, Matthew Harkey²

¹University of Virginia, ²Michigan State University

P1-82 146360 *Predicting warfighter physical performance and readiness metrics from sensor data collected during ruck march*

Preetish Rath¹, Seth Elkin-Frankston², Amy Silder³, Josiah Steckenrider⁴, Victoria Bode², Michael Hughes¹

¹Tufts University, ²Combat Capabilities Development Command (DEVCOM) Soldier Center, ³Naval Health Research Center, ⁴United States Military Academy

P1-83 146365 Sleep quality & its affect on dual task cost when examining step length in healthy adults

Mattie Higgins¹, Hyeon Heselton², Dawn Venema³, Julie Boron², Jenna Yentes¹

¹Texas A&M University, ²University of Nebraska Omaha, ³University of Nebraska Medical Center

P1-84 146374 *Regularity of center of pressure reflects task difficulty during standing dual-task*

Jennifer Yentes¹, Emerson Sebastião² ¹Texas A&M University, ²Northern Illinois University

P1-85 146378 *Predictive kinematic modeling of reaching tasks within a spacesuit*

Kyra Lee¹, Han Kim², Sudhakar Rajulu³ ¹University of Puget Sound, ²Leidos, ³National Aeronautics and Space Administration

P1-86 146380 *Effects of high-altitude training conditions on lower body power*

Robert Murphy¹, Amy Silder², Douglas Jones², Pinata Sessoms², Tony Duong², Rebecca Zifchock¹, Luke Brown¹

¹United States Military Academy, ²Naval Health Research Center



P1-88 146388 Sagittal plane coordination strategies to mitigate knee loading during landing between males and females

Justin Dennis¹, Kevin Choe², Melissa Montgomery³, Scott Lynn³, Brock Crews⁴, Derek Pamukoff⁵

¹University of North Carolina at Chapel Hill, ²Whittier College, ³California State University, Fullerton, ⁴Sanford Sports, Sanford Health, ⁵Western University

P1-89 146390 Foot placement covariance is unaffected by an explicit target before obstacle crossing

Ashwini Kulkarni¹, Chuyi Cui¹, Shirley Rietdyk¹, Satyajit Ambike¹

¹Purdue University

P1-90 146394 *Quantifying the effects of American football shoulder pads on reach distance and player perception of comfort and fit*

Claudia Town¹, Ron Jadischke², David Andrews¹ ¹University of Windsor, ²Xenith

P1-92 146400 *Human gait entrainment to soft robotic hip perturbations on a self-paced tread-mill: a preliminary study*

Omik Save¹, Sidhant Das¹, Evan Carlson¹, Hyunglae Lee¹

¹Arizona State University

P1-93 146401 The potential of the 180-degree cutting maneuver as an ACL injury assessment

Alejandro Ovispo-Martinez¹, Henry Wang¹, Dorice Hankemeier¹, Clark Dickin¹ ¹Ball State University

P1-94 146402 The role of kinematic estimation accuracy in learning with wearable haptics

Nataliya Rokhmanova¹, Owen Pearl¹, Katherine Kuchenbecker², Eni Halilaj¹

¹Carnegie Mellon University, ²Max Planck Institute

P1-95 146403 *Concurrent validity of four motion capture systems for measuring joint angles at discrete timepoints during dynamic movements*

Nathan Edwards¹, Jaclyn Caccese¹, Ryan Tracy¹, Joshua Hagen¹, James Oñate¹ ¹The Ohio State University

P1-96 146404 *Postural control deficits on a continuously moving platform in participants with chronic ankle instability*

Xiaohan Xu¹, Genevieve Williams¹, Joanna Bowtell¹, Will Young¹, Daniel Fong²

¹University of Exeter, ²University of Loughborough

P1-97 146406 Determining the effect of elbow and wrist angles on maximum voluntary contraction surface electromyography signals of upper extremity muscles

John Calisi¹, Anthony Zamarra¹, Benjamin Wheatley¹ ¹Bucknell University

P1-98 146408 *Can instrumented insoles detect hip and knee medial collapse?*

Aspen Chadderdon¹, Molly Shepherd¹, Marcie Harris-Hayes¹, Michael Harris¹ ¹Washington University in St Louis

P1-99 146409 *Failure loads of suture anchors for Achilles tendon prosthesis in a rabbit model*

Obinna Fidelis¹, Katrina Easton¹, David Anderson¹, Pierre-Yves Mulon¹, Dustin Crouch¹ ¹University of Tennessee Knoxville

P1-100 146410 *Deep learning for automatic segmentation of quadriceps cross-sectional area: validation in people with anterior cruciate ligament injury*

Beyza Tayfur¹, Paul Ritsche², Jacob Leuteneker¹, Madison Wheeler¹, Olivia Sunderlik¹, Oliver Faude², Martino Franchi³, Alexa Johnson¹, Riann Palmieri-Smith¹

¹University of Michigan, ²University of Basel, ³University of Padua

P1-101 146411 *Measuring volume and volume change of transtibial residual limbs using a high-precision laser scanning system*

Mohammadreza Freidouny¹, Carson Squibb¹, Michael Philen¹, Michael Madigan¹ ¹Virginia Tech

¹Virginia Tech

P1-102 146412 *Manual muscle testing approach for EMG normalization in young and older adults*

Skylar Holmes¹, Ericber Jimenez Francisco², Katherine Boyer¹

¹University of Massachusetts Amherst, ²San Francisco Giants

P1-103 146415 *Development and assessment of a three-dimensional computational model of the neonatal brachial plexus*

Sarah Wright¹, Michele Grimm¹ ¹Michigan State University

P1-104 146416 *Dual task gait is not adversely affected by a career of collision sports*

Thomas Buckley¹ ¹University of Delaware

P1-105 146418 *Lost to the decades: A promising variable for postural intervention*

Katherine Feroben¹, Nathan Schilaty¹, Nathaniel Bates², Takashi Nagai³

¹University of South Florida, ²Ohio State University, ³USARIEM

P1-106 146419 Biomechanical outcomes associated with 3 commercially available microprocessor knees during level ground and stair ascent walking tasks

Kinsey Herrin¹, Sujay Kestur¹, Sixu Zhou¹, Aaron Young¹

¹Georgia Institute of Technology

P1-107 146421 *Optimal-prep motor learning strategies improves quadriceps peak torque in patients with anterior cruciate ligament reconstruction*

Jennifer Hogg¹, Ryan Mayfield¹, Evan Harper¹, Levi Grace¹, Jed Diekfuss²

¹University of Tennessee at Chattanooga, ²Emory Sports Performance And Research Center

P1-108 146422 Effectiveness of solid gel as an alternative to traditional liquid ultrasound gel for musculoskeletal ultrasound imaging

Samuel Kwak¹, Madison Gaines¹, W. Knox Pittman¹, Young-Hui Chang¹

¹Georgia Institute of Technology

STER LISTINGS

PO

P1-109 146423 A single session VR based mirror therapy affects motor cortex but not neuromus-cular activations

Sheridan Parker¹, Brian Ricks¹, Nick Stergiou¹, Jorge Zuniga¹, Brian Knarr¹

¹University of Nebraska at Omaha

P1-110 146424 Association between heart rate resting state entropy and heart rate dynamics in patients with aortic stenosis

Peggy Ackun¹, Patricio Arrue¹, Nima Toosizadeh¹ ¹University of Arizona

P1-111 146425 *Can physical therapy training enhance use of a passive-dynamic ankle-foot orthosis for individuals post-stroke?*

Zahra McKee¹, Jacob Skigen¹, Darcy Reisman¹, Elisa Arch¹

¹University of Delaware

P1-112 146426 The effects of cervical spine immobilization and deformities on walking balance

Emily Eichenlaub¹, Aaron Gelinne², Deb Bhowmick³, Jason Franz¹

¹University of North Carolina - Chapel Hill/North Carolina State University, ²University of North Carolina - Chapel Hill, ³Duke University

P1-87 146428 *Effect of inversion and eversion angle on ankle plantarflexion torque*

Zane Colvin¹, Gabriela Diaz¹, Alena Grabowski¹ ¹University of Colorado Boulder

P1-240 146429 *Human lower extremity muscle fiber lengths do not scale with body dimensions*

Jongsang Son¹, Samuel Ward², Richard Lieber³ ¹New Jersey Institute of Technology, ²University of California San Diego, ³Shirley Ryan AbilityLab

P1-113 146431 Cycling cadence but not workrate improves gait velocity

Christopher Keating¹, Rials Hester² ¹Univsersidad Católica De Murcia, ²The University of Southern Mississippi

P1-114 146432 *Development of an automated framework for a TinyML-based fall detection system*

Mojtaba Mohasel¹, Lindsey Molina², Shane Wurdeman³, Richard Neptune⁴, Corey Pew¹ ¹Montana State University, ²Exponent Inc., ³Hanger Clinic, ⁴The University of Texas at Austin



P1-115 146433 The effects of real time visual feedback on step-to-step transition work during walking in people with transtibial amputation

Caelyn Hirschman¹, Janet Zhang-Lea², Alena Grabowski¹

¹University of Colorado Boulder, ²Gonzaga University

P1-116 146434 Walking speed and footwear on gait kinematics: a comparison between elderlies and adolescents

Keven Santamaria-Guzman¹, Tyrone Loria-Calderon², Mynor Rodriguez-Hernandez², Jaimie Roper¹

¹Auburn University, ²University of Costa Rica

P1-117 146435 *Knee excursion is related to dynamic postrual stability after ACL reconstruction*

Alexa Johnson¹, Riann Palmieri-Smith¹ ¹University of Michigan

P1-118 146436 *Detecting events to define phases of the baseball swing*

Sarah Hildreth¹, Christopher Camp¹, Kenton Kaufman¹ ¹Mayo Clinic

P1-119 146437 *Effects of unilateral ankle loading on muscle activity during walking*

Huaqing Liang¹ ¹Marshall University

P1-120 146438 *Regularity of lower limb joint angle motions decreased after a six-month supervised exercise therapy*

Farahnaz Fallahtafti¹, Zahra Salamifar¹, Iraklis Pipinos², Jason Johanning², Sara Myers¹ ¹University of Nebraska at Omaha, ²University of Nebraska medical center

P1-121 146439 Differences between windup and stretch pitching biomechanics in baseball

Glenn Fleisig¹, Rafael Escamilla², Jonathan Slowik¹ ¹American Sports Medicine Institute, ²California State University, Sacramento

P1-122 146441 *Exploring the effect of physical activity lifestyle on in vivo passive stiffness in the lumbar spine*

Chelsea Dumasal¹, Kayla Fewster¹ ¹University of British Columbia

P1-123 146442 *Characterizing muscle fatigue in sEMG data with topological data analysis*

Allyson Clarke¹, Benjamin Wheatley¹, Chulhyun Ahn² ¹Bucknell University, ²Geisinger

P1-124 146443 *Effects of static exercises on hip muscle fatigue assessed by surface electromyography*

Olivia Dyer¹, Benjamin Wheatley², Mark Seeley¹ ¹Geisinger, ²Bucknell University

P1-125 146445 On designing an implantable trapezium replacement bone for measuring in vivo loads at the base of the thumb

J.J. Trey Crisco¹, Julia Henke¹, Daniel McDermott¹, Rohit Badida¹, Amy Morton¹, Josephine Kalshoven¹, Douglas Moore¹

¹Brown University

P1-126 146446 *Shoulder pain and variability of wheelchair handrim kinetics in spinal cord injury*

Caleb Cordes¹, Josh Leonardis², Alyssa Schnorenberg¹, Shubhra Mukherjee³, Karin Goodfriend⁴, Amee Seitz⁵, Lawrence Vogel³, Brooke Slavens¹

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P1-127 146449 Change in pre-season training timing impacts running metrics in D1 field hockey

Kathleen Bieryla¹, Jared Miner², Ryan Snyder² ¹University of Portland, ²Bucknell University

P1-128 146450 Strategies used to reduce knee loading in single-limb squat 3-4 months post-ACLr

Jiaqi Wang¹, Susan Sigward¹ ¹University of Southern California

P1-131 146458 The efficacy and feasibility of biofeedback in ergonomics

Demir Tuken¹, Ian Silva¹, Rachel Vitali¹ ¹University of Iowa College of Engineering



P1-132 146459 *Relationship of hip muscle strength to walking and balance performance in unilateral transtibial prosthesis users*

Andrew Sawers¹, Stefania Fatone² ¹University of Illinois Chicago, ²University of Washington

P1-133 146460 *Is it the virtual environment or just the head-mounted virtual reality device that induces postural instability?*

Harish Chander¹, Hannah Freeman², Adam Knight¹ ¹Mississippi State University, ²The University of Alabama at Birmingham

P1-134 146461 Comparison of joint angles between healthy and osteoarthritic trapeziometacarpal joints using dynamic computed tomography

Michael Kuczynski¹, Charley Hasselaar¹, Gurpreet Dhaliwal¹, Neil White¹, Sarah Manske¹

¹University of Calgary

P1-135 146462 Impact force on five common *running surfaces*

Thomas Urrunaga¹, Kurt DeGoede¹, Brian Falk¹ ¹Elizabethtown College

P1-136 146464 *Measures of limb clearance suggest all obstacles are not created equal*

Ashlyn Jendro¹, MaryAnn Gundlach¹, Hope Hanson¹, Tiphanie Raffegeau², Abigail Schmitt¹ ¹University of Arkansas, ²George Mason University

P1-137 146466 *Design and use of a novel device for perturbing foot placement during over-ground walking*

Richard Smith¹, Michelle Karabin², Mark Redfern² ¹Carnegie Mellon Pole Vault, ²University of Pittsburgh

P1-138 146467 Generalized joint hypermobility and neck pain: effects on range of motion and strength

Rebecca Abbott¹, Kyle Dalske¹, Carly Molenaar¹, David Oriala¹, Brett Volin¹, Arin Ellingson¹ ¹University of Minnesota

P1-139 146468 *Load variability during a stop jump is higher in female patients with an ACLR*

Jenna Mesisca¹, Sara Arena¹, Robin Queen¹ ¹Virginia Tech

P1-140 146469 *Does the distal-to-proximal redistribution of joint mechanics affect walking economy?*

Negin Fallah¹, Owen Beck¹ ¹University of Texas at Austin

P1-141 146473 *Kinetic variability differences during a single hop between ACLR and healthy control cohorts*

Jenna Mesisca¹, Sara Arena¹, Robin Queen¹ ¹Virginia Tech

P1-142 146474 *Individuals early after ACLR show motor learning of knee mechanics during gait*

Elanna Arhos¹, Jonathan Wood², Lynn Snyder-Mackler², Karin Silbernagel², Susanne Morton² ¹The Ohio State University, ²University of Delaware

P1-143 146475 *Individuals with a ventral hernia who report moderate to high fear have worse pre-operative clinical outcomes than those with low fear*

Elanna Arhos¹, Kiana Shannon¹, Savannah Renshaw¹, Benjamin Poulose¹, Stephanie Di Stasi¹, Ajit Chaudhari¹

¹The Ohio State University

P1-144 146477 How healthy older adults adapt stepping to enact lateral maneuvers

David Desmet¹, Meghan Kazanski², Joseph Cusumano¹, Jonathan Dingwell¹

¹Pennsylvania State University, ²Emory University School of Medicine

P1-145 146478 *How healthy older adults decide between competing walking maneuvers*

David Desmet¹, Jonathan Dingwell¹ ¹Pennsylvania State University

P1-146 146479 Comparisons between *in-lab and out-of-lab free-living derived gait parameters*

Matthew Ruder¹, Monica Malek¹, Kim Madden¹, Anthony Adili¹, Dylan Kobsar¹

¹McMaster University



P1-147 146480 *Time evolution is a source of bias in the wolf et al algorithm for largest Lyapunov exponents*

Kolby Brink¹, Tyler Wiles¹, Nikolaos Stergiou¹, Aaron Likens¹

¹University of Nebraska-Omaha

P1-148 146481 Effects of movement-based interventions on spinal muscle fatigue and spine orientation during sitting office tasks: a comparative study

Zeinab Kazemi¹, Maryam Mohammadalizade², Mohammad Sadegh Ghasemi², Alireza Shaghaghi², Divya Srinivasan¹

¹Clemson University, ²Iran University of Medical Sciences

P1-149 146482 *Shoulder muscle activation timing in individuals with reduced scapular upward rotation*

Gaura Saini¹, Jarred Frisk¹, Madeline Goodson¹, Matthew Heiling¹, Lauren Reimers¹, Paula Ludewig¹ ¹University of Minnesota

P1-150 146485 A Battle of Balance: Differences in postural stability among cross-country runners, trail runners, and healthy non-runners

Cabel McCandless¹, Christopher Aiken¹, Kevin Dames²

¹New Mexico State University, ²SUNY Cortland

P1-151 146487 *Surveys of self-perceived balance integrity are poor predictors of vulnerability to balance perturbations*

Andrew Shelton¹, Jessica Allen², Vicki Mercer³, Jeremy Crenshaw⁴, Jason Franz¹

¹University of North Carolina at Chapel Hill & North Carolina State University, ²University of Florida, ³University of North Carolina at Chapel Hill, ⁴University of Delaware

P1-152 146489 *Lower extremity muscle contributions to 3-dimensional ground reaction forces during unanticipated cutting*

Shelby Peel¹, Jake Melaro², Joshua Weinhandl² ¹University of Southern Mississippi, ²University of Tennessee, Knoxville

P1-154 146492 *A mathematical modelling approach to the mechanics of multiarticular muscles*

Jessica Tingle¹, Derek Jurestovsky², Henry Astley¹ ¹University of Akron, ²Pennsylvania State University

P1-155 146494 *Dynamically measuring plantar tissue stiffness with the ultrashoe (an ultrasound embedded sandal)*

Ellen Li¹, Scott Telfer², Brittney Muir¹, William Ledoux¹

¹VA Puget Sound Healthcare, ²University of Washington

P1-156 146496 Changes in ankle power during walking at different speeds with powered ankle exoskeleton

Meredith Owen¹, Tereza Janatova¹, Kelsey Reeves¹, Benjamin Brightwell¹, Justin Pol¹, Junfei Tong², Anup Pant², Jacques Reifman², Michael Samaan¹, Brian Noehren¹

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P1-157 146498 *Assessment of two novel force control variability tasks*

Madison Mingo¹, Lindsey Remski¹, Amelia Lanier¹, Brian Knarr¹

¹University of Nebraska Omaha

P1-158 146503 Validating a resistive ankle powered exoskeleton for at home rehabilitation among individuals with cerebral palsy

Collin Bowersock¹, Jenna Moeckly¹, Shanpu Fang¹, Zachary Lerner¹ ¹Northern Arizona University

-Northern Anzona University

P1-159 146504 *Joint kinematics in infants with Down syndrome during early treadmill intervention: preliminary results*

Robert Zeid¹, Patrick Underwood¹, Jackelyne Perez¹, Jianhua Wu¹

¹Georgia State University

P1-160 146505 From subtle to severe: Mapping the continuum of symptom expression in rotator cuff tears with biomechanics.

Sarah Barron¹, Joseph King¹, Federico Pozzi¹, Jennifer Nichols¹

¹University of Florida

P1-161 146506 Accuracy of skill acquisition during an 8-week gait intervention study to reduce knee joint load in patients with knee osteoarthritis

Kelly Poretti¹, Oladipo Eddo¹, Bryndan Lindsey¹, Nelson Cortes²

¹George Mason University, ²University of Essex

P1-162 146507 *Obstacle crossing in healthy* voung and older individuals

Hope Hanson¹, Ashlyn Jendro¹, Tiphanie Raffegeau², Abigail Schmitt¹

¹University of Arkansas, ²George Mason University

P1-163 146508 *What can jumping tasks teach* about long-term compensations in joint power after an ACL reconstruction?

Tereza Janatova¹, Kelsey Reeves¹, Brian Noehren¹ ¹University of Kentucky

P1-164 146509 Load symmetry during gait following total knee arthroplasty compared to controls

Jorjie Wilson¹, Kelli Allen², Sara Arena¹, Robin Queen¹

¹Virginia Tech, ²UNC-Chapel Hill

P1-165 146511 Self-selected handrail use reduces complexity of lower limb joint movements during treadmill gait in chronic stroke survivors

Emily Steffensen¹, Joel Sommerfeld², Aaron Likens², Brian Knarr¹

¹University of Nebraska at Omaha, ²University of Nebraska at Omaha, Center for Research in Human Movement Variability

P1-166 146512 *The reliability of an IMU-based* motion capture system for dynamic margins of stability and ranges of total body angular momentum: effects of walkway length and number of strides

Jackson Lordall¹, Atabak Mehrabani¹, Sunny Bui¹, Alison Oates¹, Joel Lanovaz¹

¹University of Saskatchewan

P1-167 146513 Neck muscle fatigue from experienced soldiers wearing head-borne systems

Theresa Hardin¹, Marina Carboni¹, John Ramsay¹, Clifford Hancock¹

¹United States Army DEVCOM Soldier Center

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P1-168 146515 A robot-actuated in vitro testing approach for quantifying passive range of motion in the thumb CMC joint

Josephine Kalshoven¹, Rohit Badida¹, Amy Morton¹, Douglas Moore¹, Joseph Crisco¹ ¹Brown University

P1-169 146516 Associations between vertical stiffness and waist mounted acceleration during hopping

Jonathan (FJ) Goodwin¹ ¹Charleston Southern University

P1-170 146517 Comparing standard axillary crutches with Mobilegs® crutches in healthy adults

Yunju Lee¹, Kendall Bird¹, Cassie Esch¹, Allison Sneller¹, Meri Goehring¹ ¹Grand Valley State University

P1-171 146518 Interosseous proximity maps of the distal radioulnar joint during pronosupination using 4DCT

Cesar Lopez¹, Taylor Trentadue¹, Robert Foley¹, Andrew Thoreson¹, Shuai Leng¹, Sanjeev Kakar¹, Kristin Zhao¹

¹Mayo Clinic

P1-172 146519 Comparing jump landing kinetics after a soccer header motion in different situations

Chase Cycenas¹, Alex Lotts¹, Hayleigh Young¹, Mostafa Hegazy¹

¹Southwest Minnesota State University

P1-173 146522 A force-plate instrumented push-and-release test can estimate key kine*matic outcomes*

Michael Christensen¹, James Tracy², Jeremy Crenshaw¹

¹University of Delaware, ²University of Colorado Anschutz Medical Campus

P1-174 146524 *Comparison of three portable* IMUs' orientation accuracy during dynamic shooting

Martin Flament Fultot¹, Aidan Gross¹, Brian Higginson¹ ¹Galvion

P1-175 146525 Adults with and without knee osteoarthritis differ more on stairs than level walking

Julien Mihy¹, Mayumi Wagatsuma¹, Jenna Mlecko¹, Stephen Cain², Jocelyn Hafer¹

¹University of Delaware, ²West Virginia University

P1-176 146527 *Achilles tendon pathology and functional impairments in adolescents with heel pain*

Kayla Seymore¹, Shawn Hanlon², Bradley Bley³, Karin Grävare Silbernagel¹

¹University of Delaware, ²University of Colorado, ³Delaware Sports Medicine

P1-177 146529 *Addition of independent scapular motion to enhance the biofidelity of a musculoskeletal model*

Joshua Pataky¹, Meghan Vidt²

¹Pennsylvania State University, ²Pennsylvania State University; Penn State College of Medicine

P1-178 146532 *Minimizing the effect of camera bump on 3D DLT motion capture*

William Moynihan¹, Suzanne Konz¹, Brian Morgan¹, Steven Leigh¹ ¹Marshall University

P1-180 146535 The reliability of an IMU-based motion capture system for spatiotemporal walking parameters: effects of walkway length and number of strides

Atabak Mehrabani¹, Jackson Lordall¹, Sunny Bui¹, Alison Oates¹, Joel Lanovaz¹ ¹University of Saskatchewan

P1-181 146536 *The effects of combining self-controlled practice and focus of attention on jump performance*

Joei Velten¹, Logan Markwell², Jared Porter¹ ¹University of Tennessee, ²Jósef Piłsudski University of Physical Education in Warsaw

P1-182 146538 Error-state Kalman filter for lower-limb kinematic estimation: An evaluation for running

Jamie Ferris¹, Noel Perkins¹, Michael Potter² ¹University of Michigan, ²Francis Marion University

P1-183 146540 *Wearable sensor detection of treadmill-induced slip perturbations*

Jordan Feldman¹, Constantin Beyer², Jessica Allen³, Jason Franz¹

¹University of North Carolina at Chapel Hill and NC State University, ²Technische Universität Ilmenau, ³University of Florida

P1-184 146541 The impact of regulating the resistances of an articulated ankle foot orthosis on the paretic leg muscles of stroke survivors.

Oluwaseye Odanye¹, Emily Steffensen¹, Lindsey Remski¹, Elisa Arch², Brian Knarr¹

¹University of Nebraska Omaha, ²university of Delaware

P1-185 146542 *Hip, knee, and ankle joint forces during exoskeletal-assisted walking using a subject-specific virtual simulator*

Vishnu Chandran¹, Gabriela de Carvalho², Ann Spungen³, Noam Harel³, William Bauman⁴, Saikat Pal² ¹Hospital for Special Surgery, ²New Jersey Institute of Technology, ³James J. Peters Veterans Affairs Medical Center, ⁴Icahn School of Medicine at Mount Sinai

P1-186 146544 *Comparison of acceleration in pre- and post-season youth male soccer players*

Taliah Carlson¹, Jake Melaro¹, Joshua Weinhandl¹ ¹University of Tennessee Knoxville

P1-187 146545 *Differences in load symmetry between healthy older adults and total knee arthroplasty patients*

Tyana Scott¹, Kelli Allen², Sara Arena¹, Robin Queen¹ ¹Virginia Tech, ²University of North Carolina

P1-188 146546 Effect of unanticipated constraint on lower extremity energy absorption during jump landings following ACL reconstruction

Brendan Silvia¹, Fatemeh Aflatounian¹, James Becker¹, Keith Hutchison¹, Janet Simon², Dustin Grooms², Scott Monfort¹

¹Montana State University, ²Ohio University

P1-189 146547 *Comparison of acceleration frequency bins between pre- and post-season youth male soccer players*

Taliah Carlson¹, Jake Melaro¹, Joshua Weinhandl¹ ¹University of Tennessee Knoxville

P1-190 146548 *Assessment of varus thrust using inertial measurement units*

Millissia Murro¹, Julien Mihy¹, Mayumi Wagatsuma¹, Jocelyn Hafer¹

¹University of Delaware

P1-191 146549 *Botulinum neurotoxin injections improve hip rotation in children with Cerebral Palsy*

Archisha Kanchan¹, Gabriela de Carvalho¹, Vishnu Chandran², Catherine Mazzola³, JenFu Cheng⁴, O. Folorunsho Edobor-Osula⁵, Hannah Shoval⁶, Saikat Pal¹

¹New Jersey Institute of Technology, ²Hospital for Special Surgery, ³NJ Pediatric Neuroscience Institute, ⁴Pediatric Rehabilitation Specialists, ⁵Rutgers-New Jersey Medical School, ⁶Atlantic Health System

P1-192 146550 Botulinum toxin type A injections may improve gait kinematics towards typically developing values in children with cerebral palsy: a preliminary report

Stephanie Mace¹, Hope Voto², Brian Knarr¹, David Kingston¹

¹University of Nebraska Omaha, ²University of Nebraska Medical Center

P1-193 146551 Ability of a commercial inertial measurement unit system to quantify temporal distance measures: a pilot study

Farwa Ali¹, Cecilia Hogen¹, Keith Josephs¹, Jennifer Whitwell¹, Kenton Kaufman¹ ¹Mavo Clinic

P1-194 146552 *Multi-segment kinetic foot model shows correction of hindfoot abduction moment in frontal plane after high tibial osteotomy (HTO) surgery for knee varus*

Thomas Jenkyn¹, Songlin Zhu¹ ¹University of Western Ontario

P1-195 146554 The use of smartphones in measuring static postural stability

Jun San Juan¹, Emily Lovekin¹, April Davis¹, Vipul Lugade²

¹Western Washington University, ²Binghamton University

P1-196 146555 Stroboscopic visual disruption *alters the neuromotor control and biomechanics of depth jumping*

Kenneth Harrison¹, Jaimie Roper¹, Christopher Dakin², Anne Beethe³, Talin Louder²

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P1-197 146557 The effects of unilateral ankle loading on spatiotemporal gait parameters during treadmill walking in children and adults

Yeon-Joo Kang¹, Haneol Kim¹, Matthew Beerse², Robert Zeid¹, Patrick Underwood¹, Jianhua Wu¹ ¹Georgia State University, ²University of Dayton

P1-198 146558 A preliminary analysis of timed up and go performance in people with Essential Tremor.

Patrick Monaghan¹, Kenneth Harrison¹, Julia Christl¹, Jaimie Roper¹

¹Auburn University

P1-199 146559 *Bout duration during out-of-lab walking affects gait variability*

Mayumi Wagatsuma¹, Julien Mihy¹, Stephen Cain², Jocelyn Hafer¹

¹University of Delaware, ²West Virginia University

P1-200 146560 The influence of step width on balance response strategies during perturbed walking

Lindsey Molina¹, Gabriella Small², Richard Neptune² ¹Exponent, Inc., ²The University of Texas at Austin

P1-201 146564 The chronic effects of a stretching program on range of motion and velocity output of an overhand throw in collegiate baseball players

Keaton Hamilton¹, Brooke Odle¹, Maureen Dunn¹ ¹Hope College

P1-202 146567 *Hamstrings work demands depend on walking slope and heavy load carriage*

Jordan Sturdy¹, Hedaya Rizeq², Amy Silder³, Pinata Sessoms³, Anne Silverman¹

¹Colorado School of Mines, ²Naval Health Research Center (Leidos), ³Naval Health Research Center

P1-203 146568 *Effects of constant load exercise on knee mechanics in at-risk weight individuals*

Mariana Jacobs¹, Kylie Cochran¹, Justin Pol¹, Trey Naylor¹, Jody Clasey¹, Michael Samaan¹ ¹University of Kentucky

P1-204 146569 *Fall circumstances among walker users in long-term care facilities indicate deficiencies in walker design*

Kimberly Nickerson¹, Kailey Diaz¹, Brittney Muir² ¹University of Washington, ²Department of Veterans Affairs

P1-206 146571 *Reliability of isokinetic transverse plane hip strength testing in supine*

Vered Arbel¹, Maeve Gobeyn¹, Kharma Foucher¹ ¹University of Illinois at Chicago

P2-479 146572 *Biomechanical basis of interval throwing programs in baseball: a systematic review*

Travis Dias¹, Benjamin Lerch², Jonathan Slowik³, Kevin Wilk⁴, James Andrews³, Lyle Cain⁵, Glenn Fleisig³

¹University of South Carolina School of Medicine Greenville, ²Pennsylvania State University Harrisburg, ³American Sports Medicine Institute, ⁴Champion Sports Medicine, ⁵American Sports Medicine Instute

P1-208 146573 *Biometrics using full body human movement variability gait data*

Tyler Wiles¹, Seung Kyeom Kim¹, Nick Stergiou¹, Aaron Likens¹

¹University of Nebraska at Omaha

P1-239 146577 Effect of prosthetic foot selection on metabolic cost and knee joint loading in transtibial amputee gait during different load carriage conditions

Aude Lefranc¹, Richard Neptune¹, Glenn Klute² ¹The University of Texas at Austin, ²VA Center for Limb Loss and MoBility

P1-209 146578 The effect of light touch induced sensory feedback on postural stability in unilateral lower limb prosthesis users

Moaz Tobaigy¹, Julie Ferrell-Olson¹, Andrew Sawers¹ ¹University of Illinois-Chicago

P1-210 146579 *Wearable robotic exo-therapy can improve geriatric mobility: a case study*

Jack Williams¹, Jenna Hylin¹, Ying Fang², Julie Stone¹, Zachary Lerner¹

¹Northern Arizona University, ²Rosalind Franklin University

P2-478 146582 3D-printed dual-density meta*materials for use in accommodative insoles*

Kimberly Nickerson¹, Ellen Li¹, Scott Telfer¹, William Ledoux², Brittney Muir²

¹University of Washington, ²Department of Veterans Affairs

P1-212 146583 *Muscle adaptation to speed changes during walking in young and older adults*

Jui-Te Lin¹, Tamara Shields¹, Haley Dennerlein¹, Ami Patel¹, Jeiner Betancourt¹, Sherry Greenberg¹, Lauren Coar¹

¹Seton Hall University

P1-213 146584 Sit-to-stand balance control in diabetic peripheral neuropathy

Mohsen Alighanbari¹, Hao-Yuan Hsiao¹, Lisa Griffin¹ ¹The University of Texas at Austin

P1-214 146586 *Sagittal plane testing for infant product safety: proof of concept study*

Sarah Goldrod¹, Erin Mannen¹ ¹Boise State University

P1-217 146590 *Comparison of different hip joint center prediction methods*

Karthick Natesan¹, Hocheng Lu¹, Aaron Likness¹, Lee Atkins², Yang Hyung Suk³, Roger James¹

¹Texas Tech University Health Sciences Center, ²University of North Texas Health Sciences Center, ³University of South Dakota

P1-219 146592 Comprehensive gait asymmetry *metrics relate to gait speed and not motor impairment*

Aria Haver-Hill¹, Sarah Kettlety¹, Natalia Sanchez², Kristan Leech¹

¹University of Southern California, ²Chapman University



P1-220 146594 *Effects of growth mindsets in undergraduate kinesiology*

Stephanie Scoville¹, Brian Selgrade¹ ¹Westfield State University

P1-223 146598 The trampoline aftereffect in young adults and typically developing children

Matthew Beerse¹, Jianhua Wu² ¹University of Dayton, ²Georgia State University

P1-224 146602 *Automated movement screen: developing a data-driven scoring tool to assess spine motor dysfunction*

Carl Alano¹, Shawn Beaudette¹ ¹Brock University

P1-225 146606 *Plantar kinetics during walking aid use in persons with type 2 diabetes mellitus*

Holton Gwaltney¹, Joseph Harrington¹, Jose Anguiano-Hernandez¹, David Kingston¹ ¹University of Nebraska Omaha

P1-226 146607 *Effects of added-mass on the gait of middle-aged adults: assessed using statistical parametric mapping*

Vinayak Vijayan¹, Shanpu Fang¹, Timothy Reissman¹, Megan Reissman¹, Allison Kinney¹ ¹University of Dayton

P1-227 146609 *Changes in stimulation amplitude are correlated to changes in gait mechanics*

Margo Donlin¹, Jill Higginson¹ ¹University of Delaware

P1-228 146610 *Impulse generation of each leg in high school baseball pitchers*

Samantha Gajda¹, Jun Liu¹, Christopher Knowlton², Roy Iversen¹, Alex Smith¹, Zach Tropp², Matthew Gauthier³, Nikhil Verma², Gregory Nicholson², Anthony Romeo⁴, Antonia Zaferiou¹

¹Stevens Institute of Technology, ²Rush University Medical Center, ³University of Illinois-Chicago, ⁴Musculoskeletal Institute, Duly Health and Care

P1-229 146612 *Temporal alignment of gait phases is necessary before computing coordina-tion measures*

Elham Alijanpour¹, Abed Khosrojerdi¹, Daniel Russell¹ ¹Old Dominion University - Norfolk, VA

P1-230 146613 Statistical parametric mapping and dynamic time warping analysis of age and gait speed

Vinayak Vijayan¹, Shanpu Fang¹, Timothy Reissman¹, Allison Kinney¹, Megan Reissman¹

¹University of Dayton

P1-231 146614 *Knee effusion and pain are not related to quadriceps avoidance gait in individuals with ACL injury*

Reagan Recchia¹, Taylor McCollin¹, Michael Angelini¹, Alexa Johnson¹, Riann Palmieri-Smith¹

¹University of Michigan

P1-232 146615 Integrated whole-body angular momentum during narrowing beam walking test using passive and powered knee prostheses

Sixu Zhou¹, Sujay Kestur¹, Aaron Young¹, Kinsey Herrin¹

¹Georgia Institute of Technology

P1-233 146616 *Mediolateral gait variability in response to sensory perturbations*

Vinayak Vijayan¹, Shanpu Fang¹, Timothy Reissman¹, Allison Kinney¹, Megan Reissman¹

¹University of Dayton

P1-234 146617 *Comparative analysis of novel wearable ultrasound sensors and kinetic assessments to monitor muscle function*

Erica King¹, Ahmed Bashatah¹, Brian Guthrie¹, Margaret Jones¹, Qi Wei¹, Siddhartha Sikdar¹, Parag Chitnis¹

¹George Mason University

P1-235 146618 *Muscle oxygenation patterns during at-home and laboratory light intensity walking*

Zachary Wilson¹, Noah Rick¹, Daniel Methven¹, April Chambers¹

¹University of Pittsburgh

P1-236 146620 *The design, fabrication, and testing of a jointed foot-ankle muscle-driven endoprosthesis: white rabbit amputation models*

Heidi Seuss¹, Morteza Asgari¹, Katrina Easton¹, David Anderson¹, Dustin Crouch¹

¹The University of Tennessee at Knoxville



P1-237 146621 Vocabulary slip-ups in reporting POSTER SESSION 2 surrogate slips

Gaspard Diotalevi¹, Cecile Smeesters¹ ¹Universite de Sherbrooke

P1-238 146624 Enhancing model generalizability via transfer learning for multi-action intent recognition

David Hollinger¹, Michael Zabala¹ ¹Auburn University

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P2-239 146626 A lightweight and compliant exoskeleton for human augmentation in real world

Israel Dominguez¹, Hao Su¹ ¹NC State

P2-240 146627 Survey of requirements for exosuits and exoskeletons for at-home stroke rehabilitation

Philippe Malcolm¹, Siena Senatore¹, Marco Gonzalez-Castellon², Mukul Mukherjee¹

¹University of Nebraska at Omaha, ²University of Nebraska Medical Center

P2-241 146628 Frontal plane balance patterns of older adults during pre-planned and late-cued turns

Zahava Hirsch¹, Mitchell Tillman¹, Jun Liu¹, Allison Clark¹, Antonia Zaferiou¹

¹Stevens Institute of Technology

P2-242 146629 Combined effects of Tai-Chi gait with lateral ground support perturbations on dynamic balance control: A piolet study in younger and older adults

Jacob Smith¹, Hao-Yuan Hsiao¹, Troilyn Jackson¹, Donald Prible¹, Wei Liu¹

¹University of Texas at Austin

P2-243 146630 The impact of participant mass and height on regression-based hip joint center calculations assessed with MRI-based models

Emily McCain¹, Mario Garcia¹, Evan Dooley¹, Brody Hicks¹, Xiao Hu¹, Shawn Russell¹, Silvia Blemker¹ ¹University of Virginia

P2-244 146632 Impact of osteoarthritis and surgery on the female carpometacarpal joint of the thumb

Adam Chrzan¹, Nicole Arnold¹, Kevin Chan², Tamara Reid Bush¹

¹Michigan State University, ²Spectrum Health

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P2-245 146633 *Musculoskeletal injury risk* stratification using wearable lower-limb sensors in active-duty military populations

Don Goss¹, Ignacio Gaunaurd², Matt Helton³, Maria Gonnella⁴, Nicholas Reilly⁴, Henry Haltiwanger⁵, Robert Gailey²

¹High Point University, ²University of Miami, ³Fort Bragg, ⁴The Geneva Foundation, ⁵Womack Army Medical Center

P2-246 146634 *Quasi-stiffness as a measure for evaluating biomechanical changes across step widths*

Stephanie Molitor¹, Richard Neptune¹ ¹The University of Texas at Austin

P2-247 146636 Detecting changes in varus thrust gait using an IMU – A pilot study

Halime Gulle¹, Torstein Dæhlin¹, Irene Davis¹ ¹University of South Florida

P2-248 146637 Analysis of subjective and objective measures in assessing fall risk status in adults with Essential Tremor and adults without Essential Tremor

Julia Christl¹ ¹Auburn University

P2-249 146638 Examining IMU-derived changes in arm mobility during daily living following mastectomy and immediate breast reconstruction

Barrett Bongiorno¹, Stephen Cain², David Lipps¹ ¹University of Michigan, ²West Virginia University

P2-250 146639 *Changes in lower extremity work during prolonged walking in individuals with knee osteoarthritis*

Samantha Price¹, Joshua Stefanik², Cara Lewis³, Irene Davis⁴, Patrick Corrigan¹

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P2-251 146640 *Computational evaluation of non-contact ACL injury mechanisms*

Trent Guess¹, Jacob Thomas¹, Robert Wissman¹ ¹University of Missouri

P2-252 146641 *Kinematic comparison of the lower extremites in sport-specific and laboratory environments from lacrosse athletes*

Pratham Singh¹, Timothy Burkhart¹ ¹University of Toronto

P2-253 146642 *Camera-based vs. camera-less* (IMU-based) kinematics for estimates of lumbar spine loads using a full body musculoskeletal model

Maria Prado¹, Sakiko Oyama¹, Hugo Giambini¹ ¹The University of Texas at San Antonio

P2-254 146643 *Learning to balance on the stability platform: individual differences in motor learning*

Simon Cone¹, Rajiv Ranganathan¹ ¹Michigan State University

P2-255 146646 *Deviations in joint loading when encountering unexpected uneven terrain for healthy individuals and individuals with a transtibial amputation*

Kristen Stewart¹, Glenn Klute², Richard Neptune¹ ¹The University of Texas at Austin, ²VA Center for Limb Loss and MoBility; University of Washington

P2-256 146647 *Transfer of gravity adaptation between end-effectors: Jumping in simulated reduced gravity induces altered reaching behavior*

Chase Rock¹, Angela Luo¹, Xiao Yang¹, Young-Hui Chang¹

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P2-257 146649 *Modeling the connection between the plantar fascia and triceps surae during fixed-end contractions*

Madison Wissman¹, Aubrey Gray¹, Rebecca Krupenevich¹, Kota Takahashi², Jason Franz¹

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P2-258 146650 *Co-contraction about the ankle increases with the threat of a walking perturbation*

Nancy Nguyen¹, James Tracy², Jeremy Crenshaw¹ ¹University of Delaware, ²University of Colorado Anschutz Medical Campus

P2-259 146651 The effects of trampoline hopping on soleus h-reflex and tendon tap reflex

Zackery Wicks¹, Robert Zeid¹, Briana Finch¹, Jianhua Wu¹

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P2-260 146652 *Evaluating novel plantar pressure-based 3d printed accommodative insoles -a pilot study*

Brittney Muir¹, Jing-Sheng Li², Yuri Hudak², G. Kaufman¹, Scott Cullum², Patrick Aubin² ¹Department of Veterans Affairs, ²University of Washington

P2-261 146653 Effects of a step-rate based gait training on running gait mechanics: A systematic review and meta-analysis

Dante Goss¹, Jennifer Xu¹, Jay Hertel¹ ¹University of Virginia

P2-262 146654 *A simplified point-mass foot placement estimator: evaluation and potential applications*

Corbin Rasmussen¹, Nathaniel Hunt¹ ¹University of Nebraska at Omaha

P2-264 146656 *Portable instrumented assessment of dual task gait in mild cognitive impairment*

Jamie Hall¹, Jacob Thomas¹, Rylea Ranum¹, Andrew Kiselica¹, Rebecca Bliss¹, Trent Guess¹ ¹University of Missouri

P2-265 146657 *Dynamic postural control with cognitive task test in female athletes and non-athletes*

Alyssa Klump¹, Anisha Moorthy¹, Rianna Pfau¹, Yunju Lee¹

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P2-266 146658 The effect of acute cervical traction exercises on the stiffness of the upper trapezius and middle scalene muscles

Elise Walker¹, Constantin Heinemann², Whitney Wolff³, David Lipps¹

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P2-267 146659 Biomechanical differences between recreational and collegiate runners

Ryan Evans¹, Tyler Moffit², Peter Mitchell³, Derek Pamukoff¹

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P2-268 146661 Effect of walking speed and *rhythmic auditory stimulation on spatiotemporal parameters during treadmill walking in children and adults*

Haneol Kim¹, Zac Wicks¹, Robert Zeid¹, Jianhua Wu¹ ¹Georgia State University

P2-269 146663 What is the interaction among measured muscle volume, joint torque, and joint position at the ankle, knee, and hip?

Mario Garcia¹, Emily McCain¹, Xiao Hu¹, Shawn Russell¹, Silvia Blemker¹ ¹University of Virginia

P2-270 146664 *Different contexts constrain coordination dynamics between winning and losing teams*

Seung Kyeom Kim¹, Nicholas Stergiou¹, Aaron Likens¹ ¹University of Nebraska at Omaha

P2-271 146665 Association between lower extremity muscular recovery and physcological improvement in patients with post-acute sequelae of sars-cov-2 undergoing neuromodulation: a double-blind randomized controlled trial

Myeounggon Lee¹, Alejandro Zulbaran-Rojas¹, Rasha Bara¹, Areli Flores-Camargo¹, Ram kinker Mishra¹, Gil Spitz¹, Dipaben Modi¹, Fidaa Shaib¹, Bijan Najafi¹ ¹Baylor College of Medicine

P2-272 146666 Early macrostructural changes to the glenohumeral joint following brachial plexus birth injury

Vivian Mota¹, Kyla Bosh², Katherine Saul¹, Jacqueline Cole¹

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P2-273 146668 Segmental power analysis of a round off in a pediatric gymnast: a case study

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P2-274 146669 The effect of midsole stiffness and measurement method on ground reaction forces during running

Eleanor Scripps¹, Brian Noehren¹, Meredith Owen¹ ¹University of Kentucky

P2-276 146673 *Early stance negative knee power can be tracked using IMUs*

Fany Alvarado¹, Julien Mihy¹, Mayumi Wagatsuma¹, Jocelyn Hafer¹

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P2-277 146674 Validation of a remote upper extremity frailty assessment: utilizing Google's Mediapipe algorithm for telehealth applications

Mohammad Dehghan Rouzi¹, Myeounggon Lee¹, Nesreen El-Refaei¹, Anmol Momin¹, Bijan Najafi¹

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P2-278 146676 Anticipatory postural adjustment size is not related to first step length and speed during gait initiation for people with Parkinson disease

Chelsea Duppen¹, Nina Browner¹, Michael Lewek¹ ¹University of North Carolina Chapel Hill

P2-279 146677 A robotic lower limb surrogate for measuring the effect of IDEO strut stiffness on tibial strain

Robert McGrath¹, Michael Poppo¹, Brett Johnson², Lee Childers²

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P2-280 146681 Motor control and learning of a trunk tracking task are similar in individuals with and without chronic low back pain

Lee Chou¹, Nicholas Bray¹, Angela Lee¹, John Popovich Jr.¹

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P2-281 146682 Effect of walking speed and rhythmic auditory stimulation on kinetic gait parameters during treadmill walking in children and adults: A pilot study

Haneol Kim¹, Jianhua Wu¹ ¹Georgia State University

P2-282 146684 *Multi-dimensional assessment of age-related changes in gait and balance*

Jamie Hall¹, Jacob Thomas¹, Sam Weiss¹, Trent Guess¹ ¹University of Missouri

P2-283 146685 The effect of dual task on dynamic postural control during gait initiation

Angeloh Stout¹, Ke'Vaughn Waldon¹, Kaye Mabbun¹, Miguel Barcellano¹, Sandra Cuenca¹, Gu Kang¹ ¹University of Texas at Dallas

P2-284 146686 *Comparison of joint angle prediction algorithms to control a lower-limb exoskeleton emulator*

David Hollinger¹, Ryan Pollard¹, Michael Zabala¹ ¹Auburn University

P2-285 146687 A novel approach to quantify manual wheelchair propulsion patterns

Kathylee Pinnock Branford¹, Meegan Van Straaten², Omid Jahanian², Melissa Morrow³, Stephen Cain¹ ¹West Virginia University, ²Mayo Clinic, ³University of Texas Medical Branch

P2-286 146688 Predicting performance effects of applied propulsive force in over-ground walking

Evan Dooley¹, Shawn Russell¹ ¹University of Virginia

P2-287 146692 *Powered knee exoskeleton improves symmetry and reduces muscle effort during sit-to-stand transitions in individuals post-stroke: a case series*

Andrew Gunnell¹, Sergei Sarkisian¹, Tommaso Lenzi¹ ¹University of Utah

P2-288 146697 Scaling musculoskeletal models *using dnyamometry*

Varun Joshi¹, Katherine Boyer², Brian Umberger¹ ¹University of Michigan, ²University of Massachusetts

P2-289 146698 Adaptation of anterior cingulate theta-band synchronization parallels adaptation to small discrete treadmill perturbations

Jinfeng Li¹, Helen Huang¹ ¹University of Central Florida



P2-290 146700 *Age group classification with time-series gait data*

Shanpu Fang¹, Vinayak Vijayan¹, Megan Reissman¹, Timothy Reissman¹, Allison Kinney¹ ¹University of Dayton

P2-291 146701 A comparison of nerve and nerve root nonlinear elastic mechanical behavior in human, porcine, rabbit, and murine specimens

Mackenzie Hoey¹, Rachel Bruns¹, Zac Domire¹, Alex Vadati¹

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P2-477 146705 Motor control assessment using wearables during post-stroke gait

Azarang Asadi¹, Jill Higginson², Jeffrey Reinbolt¹ ¹The University of Tennessee - Knoxville, ²University of Delaware

P2-293 146706 The influence of sex and body size on hip joint centre estimation methods on knee kinematics the influence of sex and body size on hip joint centre estimation methods on knee kinematics

Harry Battersby¹, Derek Pamukoff¹, Steven Garcia², Skylar Holmes³

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P2-294 146707 Accuracy and precision of a pressure sensitive walkway measuring spatiotemporal gait parameters across different foot strike patterns

Samuel Hockett¹, Spencer Stinson¹, Caleb Williams¹, Brian Garner¹, Jonathan Rylander¹

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P2-295 146708 *Development of a low-cost biocompatible EMG electrode: sensitivity, validity, and instructions for fabrication*

Luke Stoneback¹, Genaro Fullano¹, McKenzie White¹, Sairub Naaz¹

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P2-296 146709 *Sex differences in individual muscle asymmetry levels of the lower extremity in healthy adults*

Olivia DuCharme¹, Matthew Cousins¹, Silvia Blemker¹, Lara Riem¹ ¹Springbok Analytics

P2-297 146711 *Patient reported and biomechanical outcomes for servicemembers with anterior cruciate ligament reconstruction undergoing rehabilitation at a military treatment facility*

Julia Lytle¹, Tyler Cardinale¹, Andrew Plows¹, Tatiana Djafar², Joshua Winters², Trevor Kingsbury¹

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P2-298 146712 Understanding motor adaptation in dominant vs non-dominant lower limb

Stephanie Hernández Hernández¹, Peter Adamczyk¹ ¹University of Wisconsin - Madison

P2-300 146718 *Motor segmentation predicts motor symptoms in people with Parkinson's disease*

Rebecca Daniels¹, Christopher Knight¹ ¹University of Delaware

P2-301 146720 *Opensim model for biomechanical analysis with open-source leg*

Sixu Zhou¹, Sujay Kestur¹, Kinsey Herrin¹, Aaron Young¹

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P2-302 146723 *Does a running stroller affect 3D joint kinematics?*

Amy Lista¹, Diego Carbajal¹, Lauryn Morgan¹, Benjamin Infantolino¹, Allison Altman-Singles¹, Joseph Mahoney²

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P2-303 146725 *Muscle properties in rabbits with an end-limb, muscle-attached endoprosthesis*

Fisher Adkisson¹, Dustin Crouch¹, Katrina Easton¹, Caleb Stubbs¹, Obinna Fidelis¹ ¹University of Tennessee

P2-304 146728 *Evaluating postural control of patients with diabetes using a virtual reality-based sensory organization test*

Zachary Van Dorn¹, Kai Cheng¹, Sodiq Fakorede¹, John Miles¹, Chun-Kai Huang¹ ¹kumc



P2-305 146729 *User-centric iterative design of an ankle exosuit to reduce Achilles tendon load during running*

Cameron Nurse¹, Derek Wolf¹, Katherine Rodzak¹, Rachel Teater¹, Shimra Fine¹, Chad Ice¹, Karl Zelik¹ ¹Vanderbilt University

P2-306 146730 A negative relationship between human movement variability and mind wandering

Anaelle Charles¹, Aaron Wong², Caitlin Mills², Nicholas Stergiou¹, Aaron Likens¹

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P2-308 146733 *How does a running stroller affect tibial acceleration during a run?*

Diego Carbajal¹, Amy Lista¹, Joseph Mahoney², Allison Altman-Singles¹ ¹Penn State Berks, ²Alvernia University

P2-309 146735 Evaluation of inner, close-tobody upper extremity function using a real-time feedback reachable workspace approach in children with brachial plexus birth injury

Tyler Richardson¹, Stephanie Russo², Ross Chafetz³, Spencer Warshauer³, Emily Nice³, James Richards⁴, Dan Zlotolow³, Scott Kozin³

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P2-310 146736 Focused ultrasound simulation of sciatic nerve induces peripheral muscle contraction in murine model

Zoe Moore¹, Jake Elliott¹, Julianna Simon¹, Meghan Vidt¹

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P2-311 146737 Examination of age-and sexbased differences on muscle compensation following a rotator cuff tear during a loaded dynamic task

Zoe Moore¹, Lilla Caton¹, Mitchell Vanden Heuvel¹, Joshua Pataky¹, Meghan Vidt¹

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P2-312 146739 *Age related difference in head control during falling*

James Fang¹, Lingjun Chen¹, Emilia Potts¹, Nathanael Garcia¹, Andrew Luzania¹, Danya Kumar¹, Neil Alexander¹, Jacob Sosnoff¹

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P2-313 146740 *Closed-Loop Control For Human Land And Stop Tasks*

Rodolfo Amezcua-Cerda¹, Henryk Flashner¹, Jill McNitt-Gray¹ ¹University of Southern California

P2-314 146741 Articular surface morphology and the relationship to frontal-plane ankle stiffness under loading in individuals with and without chronic ankle instability

Zoe Villamar¹, Ali Serhal², Eric Perreault¹, Daniel Ludvig¹

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P2-315 146742 *Integrating wearable IMU sensors to collect and analyze human movement outside the lab*

Anthony Wash¹, Eric Meyer²

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P2-316 146744 *Do physical outcome measures of force and velocity correlate well with rating of tennis performance in collegiate male athletes? A pilot study*

Gouresh Powar¹, Michael Olson¹ ¹Midwestern State University

P2-317 146746 *Comparing Spatial-Temporal Strategy in Older Adults Classified as Fall Risk Under Dual-Task Gait Conditions*

Brandon Peoples¹, Kenneth Harrison¹, Jaimie Roper¹ ¹Auburn University

P2-318 146748 *Preliminary study of step width predictability in older adult walking across speeds*

Aaron Fleming¹, Abbas Alili², Varun Nalam¹, He (Helen) Huang¹ ¹NC State University and UNC Chapel Hill, ²NC State University

P2-319 146750 *Completers of tandem task and dopamine medication have better postural stability in Parkinson's disease*

Alyson Moll¹, Daniel Kuhman¹, Harrison Walker¹, Carla Lima¹, Christopher Gonzalez¹, Christopher Hurt¹

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P2-320 146751 *How do changes in muscle structure and tissue quality relate to strength changes over time in Duchenne muscular dystrophy*

Allison McCrady¹, Chelsea Masterson¹, Robert Gutierrez¹, Sarah Tolman¹, Laura Barnes¹, Rebecca Scharf¹, Silvia Blemker¹

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P2-321 146752 *Increased postural threat alters control of dynamic stability following external perturbations that induce a step*

Marco Avalos¹, Shirali Shah¹, Noah Rosenblatt¹ ¹Rosalind Franklin University of Medicine and Science

P2-322 146753 Altered manual wheelchair push rim positioning: the effect on subacromial distance during propulsion

Gaura Saini¹, Aaron Hellem¹, Cyrus Rezvanifar¹, Amanuel Nigatu¹, Denzel Godwin¹, Teresa Bisson¹, Arin Ellingson¹, John Looft¹, Andrew Hansen¹, Paula Ludewig¹

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P2-323 146754 *A bottom-up modelling approach for an OpenSim thoracolumbar spine model*

Jacob Banks¹, Neal Wiggermann², Dennis Anderson³ ¹Baxter, ²Baxter Int., ³BIDMC / Harvard Medical School

P2-324 146755 The effect of age on lower limb muscle activity during single transition step descent

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P2-325 146759 *Sensor and cross-modal knowl-edge distillation for kinetics estimation*

Md Sanzid Bin Hossain¹, Zhishan Guo², Hwan Choi¹ ¹University of Central Florida, ²North Carolina State University

P2-326 146761 *Hip and knee kinematics at peak anterior foot position influences adaptations at initial contact during gait with visual feedback*

Erik Hummer¹, Melvin Mejia², Xuan Liu², Peter Barrance²

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P2-327 146762 *The effects of damping componentry on stance phase prosthetic work*

Seth Donahue¹, Matthew Major¹, Trevor Kingsbury², Kota Takahashi³

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P2-328 146763 Assessing the acute effects of wearable sensor derived auditory biofeedback on gross lumbar proprioception

Aurora Battis¹, Shawn Beaudette¹ ¹Brock University

P2-329 146764 *Locomotor adaptation to a movement amplification environment in people with chronic stroke*

Keith Gordon¹, Shamali Dusane¹, Anna Shafer² ¹Northwestern University, ²Edward Hines Jr. VA Hospital

P2-330 146765 *Preliminary results from measuring the dynamics of military tasks*

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P2-331 146767 The effect of three-month ankle foot orthosis (AFO) on spatiotemporal gait characteristics of patients with peripheral artery disease

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P2-332 146772 The effects of an inclusive badminton program on unilateral static balance for young adults with intellectual and developmental disabilities

Alana Turner¹, Isabelle Farm¹, Sachini N K Kodithuwakku Arachchige², Aaron Griffith³, Po-Lin (Leo) Chen³, Chih-Chia Chen³, Adam Knight³, Chad Smith¹, Harish Chander³

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P2-333 146773 Using loadsol data to estimate knee joint moments in stationary cycling

Walter Menke¹, Songning Zhang¹ ¹University of Tennessee, Knoxville

P2-334 146776 *Induced transient mood task to investigate the relationship between emotions and postural control in adults with glaucoma*

Natalie Bick¹, Helmet Karim¹, Howard Aizenstein¹, Mark Redfern¹, Rakie Cham¹ ¹University of Pittsburgh

P2-336 146781 Enhancing comfort and functionality: a cross-over randomized controlled trial investigating the effects of an innovative footwear intervention on pain reduction and functional performance

Graci Finco¹, Myeounggon Lee¹, Nesreen El-Refaei¹, Anmol Momin¹, Bijan Najafi¹ ¹Baylor College of Medicine

P2-337 146782 Tibial acceleration complexity *via IMUs on various turf surfaces*

Joshua Lardie¹, Jake Melaro¹, Kyley Dickson¹, John Sorochan¹, Joshua Weinhandl¹ ¹University of Tennessee, Knoxville

P2-338 146783 *Stride to stride variability throughout a prolonged treadmill walk*

Athulya Simon¹, Kiichi Ash¹, Katherine Boyer¹ ¹University of Massachusetts Amherst

P2-339 146785 Analyzing intralimb gait coordination in stroke survivors: a modified vector coding technique to compare paretic and non-paretic sides

Nikolaos Aggelousis¹, Christos Kokkotis¹, Evangeli Karampina¹, Evangelos Karakasis¹, Maria Protopapa¹, Suzana Kordosi¹, Giorgos Giarmatzis¹, Konstantinos Vadikolias¹

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P2-340 146786 Validation of BPNET for human motion dataset preparation for gait feature extraction

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P2-341 146788 The impact of biofeedback on limb stiffness and knee joint power in ACLR patients

Bryana Vasquez¹, Michael Teater¹, Sara Arena¹, Robin Queen¹

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P2-342 146789 Effects of custom dynamic orthosis proximal cuff design on foot loading

Jason Wilken¹, Sara Magdziarz¹, Kirsten Anderson¹, Molly Pacha¹, Don Anderson¹

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P2-343 146790 *External attentional focus cues* on tibial acceleration complexity via IMUs

Joshua Lardie¹, Jake Melaro¹, Kevin Valenzuela², Joshua Weinhandl¹

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P2-344 146791 Curve analysis of lower limb transition step negotiation kinematics in older adults

Mohammed Alamri¹, Emily Gerstle², Hanieh Pazhooman³, Zahra Mollaei¹, Stephen Cobb¹ ¹University of Wisconsin-Milwaukee, ²University of Scranton, ³Kinesiology Graduate Association

P2-345 146792 *Quantifying the effects of victimization on gait: an exploratory study*

Marco Avalos¹, Andrew Costa¹, Saaniya Farhan², David Kosson¹, Noah Rosenblatt¹

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P2-346 146793 *Real-time feedback results in greater outer, far-from-body and inner, close-to-body upper extremity reachable workspace in healthy adults*

Benjamin Lerch¹, Kristen Guarneschelli¹, Grigorios Papachristos¹, R. Tyler Richardson¹ ¹Pennsylvania State University Harrisburg

P2-347 146794 External attentional focus cues on tibial accelerations and symmetry via inertial measurement units during treadmill running

Joshua Lardie¹, Kevin Valenzuela², Joshua Weinhandl¹

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P2-348 146795 *Temporary loss of vasti lateralis function normalizes in vivo knee joint kinematics and reduces pain in patients with patellofemoral pain*

Frances Sheehan¹, Katharine Alter¹ ¹The National Institutes of Health

P2-349 146796 *Siamese convolutional neural networks for stroke diagnosis and explainability based on gait analysis*

Christos Kokkotis¹, Kyriakos Apostolidis¹, Evangelos Karakasis¹, Evangeli Karampina¹, Serafeim Moustakidis¹, Evangelia Makri¹, Giorgos Giarmatzis¹, Konstantinos Vadikolias¹, Nikolaos Aggelousis¹

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P2-350 146797 *IMUs required for varying levels of detail for human activity classification*

Samuel Murphy¹, Rachel Vitali¹ ¹University of Iowa

P2-351 146799 The influence of simulated labral quality condition on shoulder muscle activation patterns during isometric and functional tasks

Fergus Lam¹, Clark Dickerson¹ ¹University of Waterloo

P2-352 146801 *Stand-up and sit-down with powered knee-ankle prostheses: better, but not perfect - why?*

Grace Hunt¹, K. Bo Foreman¹, Tommaso Lenzi¹ ¹University of Utah

P2-353 146802 Changes in older adult obstacle crossing kinematics after lowering obstacle height

Gabrielle Torrijos¹, Patrick Fleming¹, Rahul Bashyal¹, Abigail Schmitt², Tiphanie Raffegeau¹ ¹George Mason University, ²University of Arkansas

P2-354 146807 Dynamic visual acuity during asymmetric walking

Charles Napoli¹, Joseph Hamill¹, Wouter Hoogkamer¹, Richard van Emmerik¹

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P2-355 146808 Elephant trunk biomechanics *and muscle mechanics using human-based techniques*

Andrew Schulz¹, Maggie Zhang², Cassandra Shriver², Krishma Singal²

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P2-356 146809 *Dynamic tracking of knee kinematics using ultrasound: a cadaveric validation*

Matthew Blomquist¹, Everett Cartier¹, Joshua Roth¹ ¹University of Wisconsin-Madison

P2-357 146810 *Shooting dynamics in a quasi Fitts task under mechanical and perceptual loads*

Martin Fultot¹, Aidan Gross², Brian Higginson² ¹University of Massachusetts Amherst, ²Galvion Ballistics Ltd.

P2-358 146812 *Relationship between mean velocity in bipedal, tandem and unipedal stances*

Ruth Miller¹, Jett Mattison¹, Ken Pitetti¹, Nils Hakansson¹

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P2-360 146814 *Knee angle and angular velocity during a progressive lateral step-up test in children with cerebral palsy*

Sydni Whitten¹, Shelley Jakiel¹, Trevor Batson¹, Gavin Colquitt², Li Li², Joshua Vova³, Ye Shen¹, Christopher Modlesky¹

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P2-361 146815 *Curve analysis of foot kinematics in runners with plantar heel pain*

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P2-362 146816 Ankle and rearfoot angle and angular velocity impact on performance in a progressive lateral step-up test in children with cerebral palsy

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P2-363 146817 *Quadriceps steadiness and jerky knee motion for individuals with knee musculoskeletal injury and disease*

Nicholas Hunt¹, Matthew Robinett¹, Tyler Brown¹ ¹Boise State University

P2-364 146819 *Personalized control in powered knee prosthesis: a novel framework employing continuous impedance functions and PCA-based tuning*

Woolim Hong¹, He (Helen) Huang¹ ¹NC State University and UNC-Chapel Hill

P2-365 146822 The anticipation and direction of treadmill-induced slip perturbations affects the neuromechanical behavior of distal leg muscles

Emily Eichenlaub¹, Jessica Allen², Vicki Mercer³, Jeremy Crenshaw⁴, Jason Franz¹

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P2-366 146823 *Career progression in tactical athletes: effect on biomechanical and performance outcomes*

Tyler Cardinale¹, Andrew Plows¹, Julia Lytle¹, Tatiana Djafar², Josh Winters², Trevor Kingsbury¹ ¹Navy Medical Center San Diego, ²University of Kentucky

P2-367 146824 Understanding Dynamic Postural Reactions In Blind People Using An Auditory Stimulus

Lauren Luginsland¹, Kiara Barrett¹, Justin Haegele¹, Hunter Bennett¹ ¹Old Dominion University

P2-368 146825 *Low-profile wearable suit for sensing human dynamics*

Ryan Casey¹ ¹Georgia Institute of Technology

P2-369 146827 *Reliability and validity of the 3-sensor LOADSOL® insole in post-stroke participants: a curve and time-series analysis*

Nicole Rendos¹, Michael Rosenberg¹, Trisha Kesar¹ ¹Emory University

P2-370 146829 How does use of an adjustable prosthetic socket affect peak vertical ground reaction force asymmetry during walking in people with transfemoral amputation?

Gabriela Diaz¹, Alena Grabowski¹ ¹University of Colorado Boulder

P2-371 146831 *Hip moment response to mediolateral assistance provided by powered hip exoskeleton*

Zhenyuan Yu¹, Abbas Alili¹, Varun Nalam¹, Aaron Fleming¹, He (Helen) Huang¹ ¹North Carolina State University

P2-372 146832 *Real-time 3D biofeedback can improve dynamic balance control on the Y Balance Test*

Martin Kilbane¹, Melina Canter¹, Kaitlyn Bresingham¹, Edgar Bolivar-Nieto¹, James Schmiedeler¹

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P2-373 146834 *Impacts of fatigue on neuromechanical strategies in single-legged jumping*

Melody Modarressi¹, Chase Rock¹, Gregory Sawicki¹, Young-Hui Chang¹ ¹Georgia Institute of Technology

P2-374 146835 Joint work compensations in unilateral transtibial prosthesis users during gait acceleration and deceleration

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P2-375 146836 Tibial shock complexity differences between soccer athletes at different peak height velocities and across a season

Jake Melaro¹, Joshua Lardie¹, Joshua Weinhandl¹ ¹University of Tennessee, Knoxville

P2-376 146837 The importance of joint center location in scaling sexually dimorphic musculo-skeletal models

Joseph Dranetz¹, Shuo Chen¹, Hwan Choi¹ ¹University of Central Florida

P2-377 146838 *Real world gait training with a hybrid ankle exosuit in individuals with cerebral palsy*

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