Stanford

Steven Hartley Collins

Associate Professor of Mechanical Engineering and, by courtesy, of Bioengineering

Bio

BIO

Steve Collins is an Associate Professor of Mechanical Engineering at Stanford University, where he teaches courses on design and robotics and directs the Stanford Biomechatronics Laboratory. His primary focus is to speed and systematize the design and prescription of prostheses and exoskeletons using versatile device emulator hardware and human-in-the-loop optimization algorithms (Zhang et al. 2017, Science). Another interest is efficient autonomous devices, such as highly energy-efficient walking robots (Collins et al. 2005, Science) and exoskeletons that use no energy yet reduce the metabolic energy cost of human walking (Collins et al. 2015, Nature).

Prof. Collins received his B.S. in Mechanical Engineering in 2002 from Cornell University, where he performed undergraduate research on passive dynamic walking robots. He received his Ph.D. in Mechanical Engineering in 2008 from the University of Michigan, where he performed research on the dynamics and control of human walking. He performed postdoctoral research on humanoid robots at T. U. Delft in the Netherlands. He was a professor of Mechanical Engineering and Robotics at Carnegie Mellon University for seven years. In 2017, he joined the faculty of Mechanical Engineering at Stanford University.

Prof. Collins is a member of the Scientific Board of Dynamic Walking and the Editorial Board of Science Robotics. He has received the Young Scientist Award from the American Society of Biomechanics, the Best Medical Devices Paper from the International Conference on Robotics and Automation, and the student-voted Professor of the Year in his department.

ACADEMIC APPOINTMENTS

- Associate Professor, Mechanical Engineering
- Associate Professor (By courtesy), Bioengineering
- Member, Bio-X
- Faculty Affiliate, Institute for Human-Centered Artificial Intelligence (HAI)
- Member, Wu Tsai Human Performance Alliance
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Chambers Faculty Scholar, Stanford School of Engineering (2020-2024)
- Teaching Honor Roll, Tau Beta Pi of Stanford University (2020)
- Best Medical Robotics Paper Award, International Conference on Robotics and Automation (ICRA) (2015)

- Professor of the Year (student-voted), Department of Mechanical Engineering, Carnegie Mellon University (2014)
- Young Scientist Award, Post-Doctoral, American Society for Biomechanics (2013)
- Struminger Faculty Teaching Fellow, Department of Mechanical Engineering, Carnegie Mellon University (2012)
- McManus Design Award, Department of Mechanical Engineering, Cornell University (2002)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Editorial Board, Science Robotics (2019 - present)
- Associate Editor, International Journal of Robotics Research (2017 - 2019)
- Scientific Board, Dynamic Walking (2008 - present)

PROFESSIONAL EDUCATION

- Ph.D., University of Michigan , Mechanical Engineering (2008)
- B.S., Cornell University , Mechanical Engineering (2002)

LINKS

- Stanford Biomechatronics Laboratory: http://biomechatronics.stanford.edu
- Publications on Google Scholar: http://scholar.google.com/citations?user=eF5vfBAAAAAJ

Teaching

COURSES

2026-27

- Advanced Mechanical Systems Design: ME 204 (Aut)
- Mechanical Systems Design: ME 104 (Win, Spr)

2025-26

- Advanced Mechanical Systems Design: ME 204 (Aut)
- Mechanical Systems Design: ME 104 (Win, Spr)

2024-25

- Advanced Mechanical Systems Design: ME 204 (Aut)
- Mechanical Systems Design: ME 104 (Win, Spr)

2023-24

- Mechanical Systems Design: ME 104 (Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Jay Sim, Six Skov, Kristen Steudel

Doctoral Dissertation Advisor (AC)

Luke Hyman, Kyeong-Won Park, Andrew Zerbe

Master's Program Advisor

Adam Blanchard, Josie Davidson, Joseph Heimerl, Carlos McKinney, Jairo Reynoso, Lawton Skaling, Alex Tchang

Doctoral Dissertation Co-Advisor (AC)

Max Burns, Mattias Cooper

Doctoral (Program)

Sarah Glomski, Maisha Khanum, Ariane Richard, Peter Xie

Publications

PUBLICATIONS

- **Elastic energy-recycling actuators for efficient robots.** *Science robotics*
  Krimsky, E., Collins, S. H.
  2024; 9 (88): eadj7246
- **Personalizing exoskeleton assistance while walking in the real world.** *Nature*
  Slade, P., Kochenderfer, M. J., Delp, S. L., Collins, S. H.
  2022; 610 (7931): 277-282
- **Human-in-the-loop optimization of exoskeleton assistance during walking** *SCIENCE*
  Zhang, J., Fiers, P., Witte, K. A., Jackson, R. W., Poggensee, K. L., Atkeson, C. G., Collins, S. H.
  2017; 356: 1280-1284
- **Reducing the energy cost of human walking using an unpowered exoskeleton** *NATURE*
  Collins, S. H., Wiggin, M. B., Sawicki, G. S.
  2015; 522 (7555): 212-?
- **Efficient bipedal robots based on passive-dynamic walkers** *SCIENCE*
  Collins, S., Ruina, A., Tedrake, R., Wisse, M.
  2005; 307 (5712): 1082-1085
- **Amputees and non-amputees adapt similarly to split-belt treadmill assistance.** *Journal of biomechanics*
  Zerbe, A. C., Lee, M. S., Collins, S. H.
  2026; 206: 113482
- **Simulation-guided design of exotendons to reduce the energetic cost of running.** *bioRxiv : the preprint server for biology*
  Stingel, J., Bianco, N., Ong, C., Collins, S., Delp, S., Hicks, J.
  2026
- **Characterizing Expert Exoskeleton-Assisted Gait: Insights to Accelerate Ankle Exoskeleton Mastery** *IEEE TRANSACTIONS ON MEDICAL ROBOTICS AND BIONICS*
  Lakmazaheri, A., Collins, S. H.
  2026; 8 (1): 98-104
- **Improving CMA-ES convergence speed, efficiency, and reliability in noisy robot optimization problems.** *Evolutionary computation*
  Martin, R. M., Collins, S. H.
  2026: 1-35
- **Biofeedback Speeds Adaptation to Exoskeleton Gait Assistance** *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*
  Lakmazaheri, A., Collins, S. H.
  2026; 34: 468-477
- **How peak knee loads are affected by changing the mass of lower-limb body segments during walking.** *PLoS computational biology*
  Miller, D. E., Brown, A. E., Bianco, N. A., Bhise, R., Delp, S. L., Collins, S. H.
  2025; 21 (9): e1012833
- **Design of an ankle exoskeleton with twisted string actuation for running assistance.** *Wearable technologies*
  Tan, G. R., Collins, S. H.
  2025; 6: e34
- **Detecting artificially impaired balance in human locomotion: metrics, perturbation effects and detection thresholds.** *The Journal of experimental biology*
  Wu, J., Raitor, M., Tan, G. R., Staudenmayer, K. L., Delp, S. L., Liu, C. K., Collins, S. H.

2025; 228 (10)

- **A Data-Driven Approach to Estimate Changes in Peak Knee Contact Force With Exoskeleton Assistance.** *IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society*
  Miller, D. E., Brown, A. E., Bianco, N. A., Delp, S. L., Collins, S. H.
  2025; 33: 3116-3128
- **On human-in-the-loop optimization of human-robot interaction.** *Nature*
  Slade, P., Atkeson, C., Donelan, J. M., Houdijk, H., Ingraham, K. A., Kim, M., Kong, K., Poggensee, K. L., Riener, R., Steinert, M., Zhang, J., Collins, S. H.
  2024; 633 (8031): 779-788
- **Lower limb biomechanics of fully trained exoskeleton users reveal complex mechanisms behind the reductions in energy cost with human-in-the-loop optimization.** *Frontiers in robotics and AI*
  Poggensee, K. L., Collins, S. H.
  2024; 11: 1283080
- **Optimizing exoskeleton assistance to improve walking speed and energy economy for older adults.** *Journal of neuroengineering and rehabilitation*
  Lakmazaheri, A., Song, S., Vuong, B. B., Biskner, B., Kado, D. M., Collins, S. H.
  2024; 21 (1): 1
- **Lower-Limb Exoskeletons Appeal to Both Clinicians and Older Adults, Especially for Fall Prevention and Joint Pain Reduction.** *IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society*
  Raitor, M., Ruggles, S. W., Delp, S. L., Liu, C. K., Collins, S. H.
  2024; 32: 1577-1585
- **Pilot comparison of customized and generalized hip-knee-ankle exoskeleton torque profiles**
  Bryan, G. M., Franks, P. W., Song, S., Collins, S. H., IEEE
  IEEE.2024: 3256-3261
- **AddBiomechanics: Automating model scaling, inverse kinematics, and inverse dynamics from human motion data through sequential optimization.** *PloS one*
  Werling, K., Bianco, N. A., Raitor, M., Stingel, J., Hicks, J. L., Collins, S. H., Delp, S. L., Liu, C. K.
  2023; 18 (11): e0295152
- **AddBiomechanics: Automating model scaling, inverse kinematics, and inverse dynamics from human motion data through sequential optimization.** *bioRxiv : the preprint server for biology*
  Werling, K., Bianco, N. A., Raitor, M., Stingel, J., Hicks, J. L., Collins, S. H., Delp, S. L., Liu, C. K.
  2023
- **Simulating the effect of ankle plantarflexion and inversion-eversion exoskeleton torques on center of mass kinematics during walking.** *PLoS computational biology*
  Bianco, N. A., Collins, S. H., Liu, K., Delp, S. L.
  2023; 19 (8): e1010712
- **Trajectory and Sway Prediction Towards Fall Prevention.** *IEEE International Conference on Robotics and Automation : ICRA : [proceedings]. IEEE International Conference on Robotics and Automation*
  Wang, W., Raitor, M., Collins, S., Liu, C. K., Kennedy, M.
  2023; 2023: 10483-10489
- **Trajectory and Sway Prediction Towards Fall Prevention**
  Wang, W., Raitor, M., Collins, S., Liu, C., Kennedy, M.
  2023: 10483-10489
- **Human Perception of Wrist Flexion and Extension Torque During Upper and Lower Extremity Movement.** *IEEE transactions on haptics*
  Welker, C. G., Collins, S. H., Okamura, A. M.
  2022; PP
- **Robotic Emulation of Candidate Prosthetic Foot Designs May Enable Efficient, Evidence-Based, and Individualized Prescriptions.** *Journal of prosthetics and orthotics : JPO*
  Caputo, J. M., Dvorak, E., Shipley, K., Miknevich, M. A., Adamczyk, P. G., Collins, S. H.

2022; 34 (4): 202-212

- **The Effects of Incline Level on Optimized Lower-Limb Exoskeleton Assistance: a Case Series.** *IEEE transactions on neural systems and rehabilitation engineering : a publication of the IEEE Engineering in Medicine and Biology Society*
  Franks, P. W., Bryan, G. M., Reyes, R., O'Donovan, M. P., Gregorczyk, K. N., Collins, S. H.
  2022; PP
- **The split-belt rimless wheel** *INTERNATIONAL JOURNAL OF ROBOTICS RESEARCH*
  Butterfield, J. K., Simha, S. N., Donelan, J., Collins, S. H.
  2022
- **Characterizing the relationship between peak assistance torque and metabolic cost reduction during running with ankle exoskeletons.** *Journal of neuroengineering and rehabilitation*
  Miller, D. E., Tan, G. R., Farina, E. M., Sheets-Singer, A. L., Collins, S. H.
  2022; 19 (1): 46
- **General variability leads to specific adaptation toward optimal movement policies.** *Current biology : CB*
  Abram, S. J., Poggensee, K. L., Sanchez, N., Simha, S. N., Finley, J. M., Collins, S. H., Donelan, J. M.
  2022
- **The energy cost of split-belt walking for a variety of belt speed combinations.** *Journal of biomechanics*
  Butterfield, J. K., Collins, S. H.
  2022; 132: 110905
- **Five years of Science Robotics.** *Science robotics*
  Yang, G., Collins, S. H., Dario, P., Fischer, P., Goldberg, K., Laschi, C., McNutt, M. K.
  1800; 6 (61): eabn2720
- **Comparing optimized exoskeleton assistance of the hip, knee, and ankle in single and multi-joint configurations** *Wearable Technologies*
  Franks, P. W., Bryan, G. M., Martin, R. M., Reyes, R., Lakmazaheri, A. C., Collins, S. H.
  2021; 2: e16
- **Comparing optimized exoskeleton assistance of the hip, knee, and ankle in single and multi-joint configurations.** *Wearable technologies*
  Franks, P. W., Bryan, G. M., Martin, R. M., Reyes, R., Lakmazaheri, A. C., Collins, S. H.
  2021; 2: e16
- **Optimized hip-knee-ankle exoskeleton assistance reduces the metabolic cost of walking with worn loads.** *Journal of neuroengineering and rehabilitation*
  Bryan, G. M., Franks, P. W., Song, S., Reyes, R., O'Donovan, M. P., Gregorczyk, K. N., Collins, S. H.
  2021; 18 (1): 161
- **Optimized hip-knee-ankle exoskeleton assistance at a range of walking speeds.** *Journal of neuroengineering and rehabilitation*
  Bryan, G. M., Franks, P. W., Song, S., Voloshina, A. S., Reyes, R., O'Donovan, M. P., Gregorczyk, K. N., Collins, S. H.
  2021; 18 (1): 152
- **How adaptation, training, and customization contribute to benefits from exoskeleton assistance.** *Science robotics*
  Poggensee, K. L., Collins, S. H.
  2021; 6 (58): eabf1078
- **Shortcomings of human-in-the-loop optimization of an ankle-foot prosthesis emulator: a case series.** *Royal Society open science*
  Welker, C. G., Voloshina, A. S., Chiu, V. L., Collins, S. H.
  2021; 8 (5): 202020
- **The effects of ground-irregularity-cancelling prosthesis control on balance over uneven surfaces.** *Royal Society open science*
  Chiu, V. L., Voloshina, A. S., Collins, S. H.
  2021; 8 (1): 201235
- **Weighted Shoes in the Wild: Initial Insights into the Relationship Between the Effort of Walking and the Amount of Walking Performed**
  Wu, M. R., Adamczyk, P. G., Collins, S. H.
  bioRxiv.
  2021

- **Design of a hip exoskeleton with actuation in frontal and sagittal planes** *Transactions on Medical Robotics and Bionics*
  Chiu, V., Raitor, M., Collins, S. H.
  2021; 3: 773-782
- **Robotic emulation of candidate prosthetic foot designs may enable efficient, evidence-based, and individualized prescriptions** *Journal of Prosthetics and Orthotics*
  Caputo, J. M., Dvorak, E., Shipley, K., Miknevich, M., Adamczyk, P. G., Collins, S. H.
  2021: 11 pages
- **Human Perception of Wrist Torque Magnitude During Upper and Lower Extremity Movement**
  Welker, C., Collins, S. H., Okamura, A. M., IEEE
  IEEE.2021: 870
- **Sensing leg movement enhances wearable monitoring of energy expenditure.** *Nature communications*
  Slade, P., Kochenderfer, M. J., Delp, S. L., Collins, S. H.
  2021; 12 (1): 4312
- **The Iterative Learning Gain That Optimizes Real-Time Torque Tracking for Ankle Exoskeletons in Human Walking Under Gait Variations.** *Frontiers in neurorobotics*
  Zhang, J., Collins, S. H.
  2021; 15: 653409
- **Optimizing Exoskeleton Assistance for Faster Self-Selected Walking** *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*
  Song, S., Collins, S. H.
  2021; 29: 786-795
- **A hip–knee–ankle exoskeleton emulator for studying gait assistance** *The International Journal of Robotics Research*
  Bryan, G. M., Franks, P. W., Klein, S. C., Peuchen, R. J., Collins, S. H.
  2021
- **Self-selected step length asymmetry is not explained by energy cost minimization in individuals with chronic stroke.** *Journal of neuroengineering and rehabilitation*
  Nguyen, T. M., Jackson, R. W., Aucie, Y., de Kam, D., Collins, S. H., Torres-Oviedo, G.
  2020; 17 (1): 119
- **Prosthesis Inversion/Eversion Stiffness Reduces Balance-Related Variability During Level Walking.** *Journal of biomechanical engineering*
  Kim, M., Lyness, H., Chen, T., Collins, S.
  2020
- **Combating COVID-19-The role of robotics in managing public health and infectious diseases** *SCIENCE ROBOTICS*
  Yang, G., Nelson, B. J., Murphy, R. R., Choset, H., Christensen, H., Collins, S. H., Dario, P., Goldberg, K., Ikuta, K., Jacobstein, N., Kragic, D., Taylor, R. H., McNutt, et al
  2020; 5 (40)
- **Improving the energy economy of human running with powered and unpowered ankle exoskeleton assistance.** *Science robotics*
  Witte, K. A., Fiers, P., Sheets-Singer, A. L., Collins, S. H.
  2020; 5 (40)
- **Using force data to self-pace an instrumented treadmill and measure self-selected walking speed.** *Journal of neuroengineering and rehabilitation*
  Song, S. n., Choi, H. n., Collins, S. H.
  2020; 17 (1): 68
- **Bump'em: an Open-Source, Bump-Emulation System for Studying Human Balance and Gait**
  Tan, G., Raitor, M., Collins, S. H., IEEE
  IEEE.2020: 9093-9099
- **DESIGN OF LOWER-LIMB EXOSKELETONS AND EMULATOR SYSTEMS** *WEARABLE ROBOTICS: SYSTEMS AND APPLICATIONS*
  Witte, K., Collins, S. H.
  edited by Rosen, J., Ferguson, P. W.

2020: 251-274

- **LOWER LIMB ACTIVE PROSTHETIC SYSTEMS-OVERVIEW** *WEARABLE ROBOTICS: SYSTEMS AND APPLICATIONS*
  Voloshina, A. S., Collins, S. H.
  edited by Rosen, J., Ferguson, P. W.
  2020: 469-486
- **Testing Simulated Assistance Strategies on a Hip-Knee-Ankle Exoskeleton: a Case Study** *International Conference on Biomedical Robotics and Biomechatronics*
  Franks, P. W., Bianco, N. A., Bryan, G. M., Hicks, J. L., Delp, S. L., Collins, S. H.
  2020: 700–707
- **Optimal Control of an Energy-Recycling Actuator for Mobile Robotics Applications** *International Conference on Robotics and Automation*
  Krimsky, E., Collins, S. H.
  2020: 3559–3565
- **Teleoperation of an ankle-foot prosthesis with a wrist exoskeleton.** *IEEE transactions on bio-medical engineering*
  Welker, C. G., Chiu, V. L., Voloshina, A. n., Collins, S. n., Okamura, A. M.
  2020; PP
- **Bump'em: an Open-Source, Bump-Emulation System for Studying Human Balance and Gait** *International Conference on Robotics and Automation*
  Tan, G. R., Raitor, M., Collins, S. H.
  2020: 9093–9099
- **An Ankle-Foot Prosthesis Emulator Capable of Modulating Center of Pressure** *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*
  Chiu, V. L., Voloshina, A. S., Collins, S. H.
  2020; 67 (1): 166–76
- **Heuristic-Based Ankle Exoskeleton Control for Co-Adaptive Assistance of Human Locomotion** *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING*
  Jackson, R. W., Collins, S. H.
  2019; 27 (10): 2059–69
- **Connecting the legs with a spring improves human running economy.** *The Journal of experimental biology*
  Simpson, C. S., Welker, C. G., Uhlrich, S. D., Sketch, S. M., Jackson, R. W., Delp, S. L., Collins, S. H., Selinger, J. C., Hawkes, E. W.
  2019
- **Design of lower-limb exoskeletons and emulator systems** *Wearable Robotics: Systems and Applications*
  Witte, K. A., Collins, S. H.
  2019: 251–274
- **Rapid energy expenditure estimation for ankle assisted and inclined loaded walking.** *Journal of neuroengineering and rehabilitation*
  Slade, P. n., Troutman, R. n., Kochenderfer, M. J., Collins, S. H., Delp, S. L.
  2019; 16 (1): 67
- **A review of design and control approaches in lower-limb prosthetic devices** *Wearable Robotics: Systems and Applications*
  Voloshina, A. S., Collins, S. H.
  2019: 469–486
- **The effects of electroadhesive clutch design parameters on performance characteristics** *JOURNAL OF INTELLIGENT MATERIAL SYSTEMS AND STRUCTURES*
  Diller, S. B., Collins, S. H., Majidi, C.
  2018; 29 (19): 3804–28
- **An Ankle-Foot Prosthesis Emulator With Control of Plantarflexion and Inversion-Eversion Torque** *IEEE TRANSACTIONS ON ROBOTICS*
  Kim, M., Chen, T., Chen, T., Collins, S. H.
  2018; 34 (5): 1183–94
- **The Passive Series Stiffness That Optimizes Torque Tracking for a Lower-Limb Exoskeleton in Human Walking** *FRONTIERS IN NEUROROBOTICS*

Zhang, J., Collins, S. H.
2017; 11: 68

- **Step-to-Step Ankle Inversion/Eversion Torque Modulation Can Reduce Effort Associated with Balance.** *Frontiers in neurorobotics*
  Kim, M., Collins, S. H.
  2017; 11: 62
- **Muscle recruitment and coordination with an ankle exoskeleton** *JOURNAL OF BIOMECHANICS*
  Steele, K. M., Jackson, R. W., Shuman, B. R., Collins, S. H.
  2017; 59: 50–58
- **Muscle-tendon mechanics explain unexpected effects of exoskeleton assistance on metabolic rate during walking.** *journal of experimental biology*
  Jackson, R. W., Dembia, C. L., Delp, S. L., Collins, S. H.
  2017; 220: 2082-2095
- **Reducing the metabolic cost of walking with an ankle exoskeleton: interaction between actuation timing and power.** *Journal of neuroengineering and rehabilitation*
  Galle, S., Malcolm, P., Collins, S. H., De Clercq, D.
  2017; 14 (1): 35-?
- **Once-Per-Step Control of Ankle Push-Off Work Improves Balance in a Three-Dimensional Simulation of Bipedal Walking** *IEEE TRANSACTIONS ON ROBOTICS*
  Kim, M., Collins, S. H.
  2017; 33 (2): 406-418
- **Design of a lightweight, tethered, torque-controlled knee exoskeleton** *International Conference on Rehabilitation Robotics (ICORR)*
  Witte, K. A., Fatschel, A. M., Collins, S. H.
  2017: 1646–53
- **Torque control in legged locomotion** *Bio-Inspired Legged Locomotion: Models, Concepts, Control and Applications*
  Zhang, J., Collins, S. H.
  2017: 347–395
- **Increasing ankle push-off work with a powered prosthesis does not necessarily reduce metabolic rate for transtibial amputees** *JOURNAL OF BIOMECHANICS*
  Quesada, R. E., Caputo, J. M., Collins, S. H.
  2016; 49 (14): 3452-3459
- **A lightweight, low-power electroadhesive clutch and spring for exoskeleton actuation** *International Conference on Robotics and Automation*
  Diller, S., Majidi, C., Collins, S. H.
  2016: 682–689
- **An experimental comparison of the relative benefits of work and torque assistance in ankle exoskeletons** *JOURNAL OF APPLIED PHYSIOLOGY*
  Jackson, R. W., Collins, S. H.
  2015; 119 (5): 541-557
- **Once-per-step control of ankle-foot prosthesis push-off work reduces effort associated with balance during walking** *JOURNAL OF NEUROENGINEERING AND REHABILITATION*
  Kim, M., Collins, S. H.
  2015; 12
- **The influence of push-off timing in a robotic ankle-foot prosthesis on the energetics and mechanics of walking** *JOURNAL OF NEUROENGINEERING AND REHABILITATION*
  Malcolm, P., Quesada, R. E., Caputo, J. M., Collins, S. H.
  2015; 12
- **Experimental comparison of torque control methods on an ankle exoskeleton during human walking**
  Zhang, J., Cheah, C., Collins, S. H., IEEE
  IEEE COMPUTER SOC.2015: 5584–89

- **Informing Ankle-Foot Prosthesis Prescription through Haptic Emulation of Candidate Devices**
  Caputo, J. M., Adamczyk, P. G., Collins, S. H., IEEE
  IEEE COMPUTER SOC.2015: 6445–50
- **An Ankle-Foot Prosthesis Emulator with Control of Plantarflexion and Inversion-Eversion Torque**
  Collins, S. H., Kim, M., Chen, T., Chen, T., IEEE
  IEEE COMPUTER SOC.2015: 1210–16
- **Design of Two Lightweight, High-Bandwidth Torque-Controlled Ankle Exoskeletons**
  Witte, K., Zhang, J., Jackson, R. W., Collins, S. H., IEEE
  IEEE COMPUTER SOC.2015: 1223–28
- **Prosthetic ankle push-off work reduces metabolic rate but not collision work in non-amputee walking** *SCIENTIFIC REPORTS*
  Caputo, J. M., Collins, S. H.
  2014; 4
- **A Universal Ankle-Foot Prosthesis Emulator for Human Locomotion Experiments** *JOURNAL OF BIOMECHANICAL ENGINEERING-TRANSACTIONS OF THE ASME*
  Caputo, J. M., Collins, S. H.
  2014; 136 (3)
- **Emulating prosthetic feet during the prescription process to improve outcomes and justifications**
  Caputo, J. M., Collins, S. H., Adamczyk, P. G., IEEE
  IEEE.2014: 127–28
- **Two Independent Contributions to Step Variability during Over-Ground Human Walking** *PLOS ONE*
  Collins, S. H., Kuo, A. D.
  2013; 8 (8)
- **Inducing Self-Selected Human Engagement in Robotic Locomotion Training**
  Collins, S. H., Jackson, R. W., IEEE
  IEEE.2013
- **What Do Walking Humans Want From Mechatronics?**
  Collins, S. H., IEEE
  IEEE.2013
- **An Experimental Robotic Testbed for Accelerated Development of Ankle Prostheses**
  Caputo, J. M., Collins, S. H., IEEE
  IEEE.2013: 2645–50
- **Stable Human-Robot Interaction Control for Upper-limb Rehabilitation Robotics**
  Zhang, J., Cheah, C., Collins, S. H., IEEE
  IEEE.2013: 2201–6
- **The Effect of Foot Compliance Encoded in the Windlass Mechanism on the Energetics of Human Walking**
  Song, S., LaMontagna, C., Collins, S. H., Geyer, H., IEEE
  IEEE.2013: 3179–82
- **Stabilization of a Three-Dimensional Limit Cycle Walking Model through Step-to-Step Ankle Control**
  Kim, M., Collins, S. H., IEEE
  IEEE.2013
- **The effects of a controlled energy storage and return prototype prosthetic foot on transtibial amputee ambulation** *HUMAN MOVEMENT SCIENCE*
  Segal, A. D., Zelik, K. E., Klute, G. K., Morgenroth, D. C., Hahn, M. E., Orendurff, M. S., Adamczyk, P. G., Collins, S. H., Kuo, A. D., Czerniecki, J. M.
  2012; 31 (4): 918–31
- **The effect of ankle foot orthosis stiffness on the energy cost of walking: A simulation study** *CLINICAL BIOMECHANICS*
  Bregman, D. J., van der Krogt, M. M., de Groot, V., Harlaar, J., Wisse, M., Collins, S. H.

2011; 26 (9): 955–61

- **The effect of prosthetic foot push-off on mechanical loading associated with knee osteoarthritis in lower extremity amputees** *GAIT & POSTURE*
  Morgenroth, D. C., Segal, A. D., Zelik, K. E., Czerniecki, J. M., Klute, G. K., Adamczyk, P. G., Orendurff, M. S., Hahn, M. E., Collins, S. H., Kuo, A. D.
  2011; 34 (4): 502-507

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