

SHAWN M. O'CONNOR

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Education

2006-2009: Ph.D. Biomedical Engineering, University of Michigan, Ann Arbor, MI, USA
Dissertation Title: The Relative Roles of Dynamics and Control in Bipedal Locomotion

2004-2006: M.S. Biomedical Engineering, University of Michigan, Ann Arbor, MI, USA

1999-2004: B.S. Mechanical Engineering, Highest Honors, Georgia Institute of Technology, Atlanta, GA, USA

Research and Professional Experience

2016- : Assistant Professor, School of Exercise and Nutritional Sciences, San Diego State University, San Diego, CA, USA

2016: Research Health Science Specialist, VA San Diego Healthcare System, San Diego, USA
Neuromuscular Bioengineering Laboratory, Sameer Shah

2013-2015: Postdoc - Research Associate, University of California, San Diego, USA
Dept of Orthopaedic Surgery and Bioengineering, Muscle Physiology Laboratory, Richard Lieber

2009-2013: Postdoctoral Researcher, Simon Fraser University, Canada
Dept. of Biomedical Physiology and Kinesiology, Locomotion Laboratory, Max Donelan

2004-2009: Graduate Student Research Assistant, University of Michigan, USA
Dept. of Mechanical Engineering, Human Biomechanics and Control Laboratory, Art Kuo

2003-2004: Undergraduate Student Research Assistant, Georgia Institute of Technology, USA
Dept. of Biomedical Engineering, Laboratory for Neuroengineering, Steve DeWeerth

Teaching Experience

Fall 2016: ENS 306 – Biomechanics of Human Movement
Exercise and Nutritional Sciences, San Diego State University (175 undergraduate students)
Theoretical concepts and applied problem-solving in various biomechanical applications in human movement.

Guest Lecturer 05/2014: ENS 306 – Biomechanics of Human Movement
Exercise and Nutritional Sciences, San Diego State University

Guest Lecturer 11/2009: KIN 801 – Seminar on Research in Kinesiology
Biomedical Physiology and Kinesiology, Simon Fraser University

Fall 2008, Winter 2009: Engineering Graduate Student Instructor Mentor

Center for Research on Learning and Teaching, University of Michigan, (15-25 instructors)

Mentored graduate student instructors and provided feedback for improving teaching by observing instructors in the classroom and organizing mid-term student feedback. Co-developed training sessions for new instructors on handling office hours and seminars on incorporating active learning techniques into lectures.

Fall 2007: Biomedical Engineering 458 - Biomedical Instrumentation and Design

Biomedical Engineering, University of Michigan (19 undergraduate and graduate students)

Graduate Student Instructor for laboratory-based course on the design and construction of biosensors (EMG, EKG, Pulse-Ox).

Industry Work Experience

2009: Research Engineer, Intelligent Prosthetic Systems L.L.C. Ann Arbor, MI, USA

Developed passive dynamic walking simulations to determine how leg compliance affects gait timing, stability and energetics in compliant ankle prostheses.

2000-2002: Mechanical Engineering Co-op, Motorola, Inc., Lawrenceville, GA, USA

Designed testing equipment and measurement protocols for several cell phone battery models; Led mechanical design of Motorola V70 accessory battery and received design committee approval; Led mechanical re-design of Sapphire battery: final design yielded a yearly cost reduction of \$960,000 to \$1,440,000.

Journal Publications (Peer-Reviewed)

Young K.W., Kuo B.P., **O'Connor S.M.**, Radic S., Lieber R.L. (Accepted) "In vivo sarcomere length measurement in whole muscles during passive stretch and twitch contractions" *Biophysical Journal*.

Maeda* R.S., **O'Connor* S.M.**, Donelan J.M., Marigold D.S. (In Press) "Foot placement relies on state estimation during visually guided walking." *Journal of Neurophysiology*. (*1st two authors contributed equally to this work).

O'Connor S.M., Baweja H.S., Goble D.J. (2016) "Validating the BTrackS Balance Plate as a low cost alternative for the measurement of sway-induced center of pressure." *Journal of Biomechanics*. 49(16): 4142-4145.

O'Connor S.M., Wong J.D., Donelan J.M. (2016) "A generalized method for controlling end-tidal respiratory gases during non-steady physiological conditions." *Journal of Applied Physiology*. 121(6): 1363-1378.

Jensen E., Go S., **O'Connor S.M.**, Evertz L., Morrow D., Ward S.R., Lieber R.L., Kaufman K.R. (2016) "Design Considerations of a Fiber Optic Pressure Sensor Protective Housing for Intramuscular Pressure Measurements." *Annals of Biomedical Engineering*, 1-8.

O'Connor S.M., Chang E.J., Ward S.R., Lieber R.L. (2016) "Quantification of sarcomere length distribution in whole muscle frozen sections." *Journal of Experimental Biology*, 219(10): 1432-1436.

Franz J.R., Francis C.A., Allen M.S., **O'Connor S.M.**, Thelen D.G. (2015) "Advanced age brings a greater reliance on visual feedback to maintain balance during walking" *Human Movement Science*, 40: 381-392.

Francis C.A., Franz J.R., **O'Connor S.M.**, Thelen D.G. (2015) "Gait variability in healthy old adults is more affected by a visual perturbation than by a cognitive or narrow step placement demand." *Gait & Posture*, 42(3): 380-385.

Selinger J.C., **O'Connor S.M.**, Wong J.D., Donelan J.M. (2015) "Humans continuously optimize energetic cost during walking" *Current Biology*, 25(18): 2452-2456.

O'Connor S.M., Dawson T.J., Kram R, Donelan J.M. (2014) "The kangaroo's tail powers pentapedal locomotion" *Biology Letters*, 10(7).

Young K.W., Radic S., Myslivets E., **O'Connor S.M.**, Lieber R.L. (2014) "Resonant reflection spectroscopy of biomolecular arrays in muscle" *Biophysical Journal*, 107(10): 2352-2360.

More* H.L., **O'Connor* S.M.**, Brøndum E., Wang T., Bertelsen M.F., Grøndahl C., Kastberg K., Hørlyck A., Funder J., Donelan J.M. (2013) "Sensorimotor responsiveness and resolution in the giraffe." *Journal of Experimental Biology*, 216: 1003-1011. (*1st two authors contributed equally to this work)

O'Connor S.M., Donelan J.M. (2012) "Fast visual prediction and slow optimization of preferred walking speed." *Journal of Neurophysiology*. 107(9): 2549-2559.

O'Connor S.M., Xu H.Z., Kuo A.D. (2012) "Energetic cost of walking with increased step variability." *Gait & Posture*. 36(1): 102-107.

O'Connor S.M., Kuo A.D. (2009). "Direction-dependent control of balance during walking and standing." *Journal of Neurophysiology*. 102(3): 1411-1419.

Engineering Conference Proceedings (Peer-Reviewed)

Ross, J.D., **O'Connor, S.M.**, Blum, R.A., Brown, E.A., DeWeerth, S.P. "Multielectrode impedance tuning: reducing noise and improving stimulation efficacy" *International Conference of the IEEE Engineering in Medicine and Biology Society*, September 2004, San Francisco, CA. Conference Proceedings; Volume 2, 2004 Page(s): 4115 - 4117 Vol.6

Submitted Manuscripts

Wong J.D., **O'Connor S.M.**, Selinger J.C., Donelan J.M. "Contribution of blood oxygen and carbon dioxide sensing to the energetic optimization of human walking" *Journal of Physiology*.

O'Connor S.M., Kaufman K.R., Ward S.R., Lieber R.L. "Intramuscular pressure correlates with muscle tension in rabbit tibialis anterior." *Journal of Biomechanics*.

Manuscripts in Preparation (data collection completed)

O'Connor S.M. "Visual control of walking balance is speed and direction dependent." *Gait & Posture*.

O'Connor S.M., Kaufman K.R., Ward S.R., Lieber R.L. "An intramuscular pressure sensor predicts active and passive muscle tension following tenotomy." *Clinical Biomechanics*.

Winters* T.M., **O'Connor* S.M.**, Lieber R.L., Ward S.R. "Nonlinear Scaling of Passive Mechanical Properties Among Fibers, Bundles Fascicles and Whole Rabbit Muscles." *Journal of Applied Physiology*. (*1st two authors contributed equally to this work)

Media Coverage

Selinger and O'Connor et al. (2015) *Current Biology* covered in New York Times, BBC News, TIME Magazine, Science News Magazine, CBS News, LA Times, New Scientist, the Globe and Mail.

O'Connor et al. (2014) *Biology Letters* covered in National Geographic News, Inside JEB, New York Times, Science – News Section, Nature – Research Highlights, Reuters, Slate, Australian Geographic, New Scientist, Live Science, ABC, CBC

Experimental methodology from O'Connor and Donelan (2012) *Journal of Neurophysiology* covered on mathworks.com and in a **MATLAB Digest** article titled "Using MATLAB, Virtual Reality, and a Treadmill to Investigate How Humans Use Visual Input to Control Their Gait"

O'Connor and Donelan (2012) *Journal of Neurophysiology* covered in New York Times and Runners World.

More and O'Connor et al. (2012) *Journal of Experimental Biology* covered in Inside JEB article titled "Treading carefully: slow sensing and responding in giraffes" and in Discover Magazine and Videnskab.dk news online content.

Invited Talks

"Balance, Energy, and Muscle Health" San Diego State University, Department of Exercise and Nutritional Sciences, February 10, San Diego, CA.

"How dynamics and energetics influence the neural control of locomotion" California State University, San Marcos, Department of Kinesiology, March 2014, San Marcos, CA.

"How limb dynamics and gait energetics influence the neural control of locomotion" University of California San Diego, Institute for Neural Computation, March 2013, La Jolla, CA.

"How limb dynamics and gait energetics influence the neural control of locomotion" San Diego State University, Department of Mechanical Engineering, March 2013, San Diego, CA.

"Body then brain: How limb dynamics and gait energetics influence the neural control of locomotion" Simon Fraser University, Department of Biomedical Physiology and Kinesiology, February 2013, Burnaby, BC, Canada.

"Physiological mechanisms underlying prediction and optimization of metabolic cost during walking" *Dynamic Walking Conference*, May 2012, Pensacola, FL.

"How dynamics and metabolic cost influence the neural control of locomotion and balance" University of Miami, Department of Kinesiology and Sport Sciences, April 2012, Miami, FL.

"Simplified models of locomotion: a little does a lot" *IRMACS Modeling Consortium*, Simon Fraser University, March 2012, Burnaby, BC, Canada.

"Limit Cycles: A Tutorial" (Co-presented with Peter Adamczyk), *Dynamic Walking Conference*, June 2009, Burnaby, BC, Canada.

Podium Presentations

Kaufman K.R., Go S.A., **O'Connor S.M.**, Wheatley B.B., Litchy W.J., Haut Donahue, T.L., Odegard G.M., Ward S.R., Lieber R.L. "Quantitative muscle force measurement using intramuscular pressure" *Biomedical Engineering Society Annual Meeting, October 2016, Minneapolis, MN.*

Wong J.D., Selinger J.C., **O'Connor S.M.**, Donelan J.M. "Does motor variability in overground walking drive the spontaneous optimization for energy?" *Dynamic Walking Conference, June 2016, Ann Arbor, MI.*

Catanzarite T., Bou-Malham L., Esparza, M., O'Connor S.M., Alperin M. "Pelvic floor muscles response to mechanical strains associated with birth injury" *American Urogynecologic Society 337th Annual Scientific Meeting, September 2016, Denver, CO.*

Selinger J.C., Wong J.D., **O'Connor S.M.**, Donelan J.M. "How people initiate energy optimization and converge on their optimal gaits" *Conference of the Canadian Society of Biomechanics, July 2016, Hamilton, ON, Canada*

Selinger J.C., Wong J.D., **O'Connor S.M.**, Donelan J.M. "Energetic cost optimization in human locomotion" *Dynamic Walking Conference, June 2014, Zurich, Switzerland*

O'Connor S.M. "Active control of walking balance is speed and direction dependent" *Conference of the Canadian Society of Biomechanics, June 2012, Vancouver, BC, Canada*

More H.L., **O'Connor S.M.**, Donelan J.M. "Sensorimotor responsiveness and resolution in the giraffe" *Conference of the Canadian Society of Biomechanics, June 2012, Vancouver, BC, Canada*

O'Connor S.M., Donelan J.M. "Vision influences the predictive minimization of energetic cost during walking" *Northwest Biomechanics Symposium, June 2011, Vancouver, BC, Canada*

O'Connor, S.M., Kuo, A.D. "Direction dependent visual weighting for walking and standing balance" *Dynamic Walking Conference, June 2009, Burnaby, BC, Canada.*

O'Connor, S.M., Kuo, A.D. "Direction dependent weighting of vision for walking balance" *North American Congress on Biomechanics, August 2008, Ann Arbor, MI.*

O'Connor, S.M., Kuo, A.D. "Predictions of an elastic locomotion model" *Dynamic Walking Conference, May 2008, Delft, The Netherlands.*

O'Connor, S.M., Kuo, A.D. "Visual Perturbation of Walking Balance" *Conference of the American Society of Biomechanics, August 2007, Palo Alto, CA.*

O'Connor, S.M., Kuo, A.D. "Walking, Skipping, and Running Produced From a Single Bipedal Model" *Conference of the American Society of Biomechanics, August 2007, Palo Alto, CA.*

O'Connor S.M., Kuo A.D. "Dynamic bipedal locomotion on compliant legs" *World Congress of Biomechanics, August 2006, Munich, Germany, Journal of Biomechanics 2006; Vol. 39 Suppl. 1, page S359*

O'Connor, S.M.; Kuo, A.D. "Elastic dynamic walking" *Dynamic Walking Conference, May 2006, Ann Arbor, MI.*

O'Connor, S.; Kuo, A.D. "Optimization of feedforward and feedback control during walking" *Congress of the International Society of Biomechanics and American Society of Biomechanics, August 2005, Cleveland, OH.*

Poster Presentations

O'Connor S.M., Chang E.J., Ward S.R., Lieber R.L. "Sarcomere Length Variation of Whole Skeletal Muscle" *Orthopaedic Research Society Annual Meeting*, March 2015, Orlando, FL.

Selinger, J.C., **O'Connor, S.M.**, Wong, J.D., Donelan, J.M. "Humans Continuously Optimize Energetic Cost during Walking" *International Society for Posture and Gait Research*, July 2015, Seville, Spain.

O'Connor S.M., Chang E.J., Ward S.R., Lieber R.L. "Systematic sarcomere length variation across entire skeletal muscle" *American College of Sports Medicine Annual Meeting*, May 2015, San Diego, CA.

O'Connor, S.M., Lieber, R.L. "A two-dimensional laser diffraction scanner for quantifying sarcomere length variability in whole muscle sections" *Alternative Muscle Club Annual Meeting*, August 2014, San Diego, CA.

O'Connor, S.M., Lieber, R.L. "A two-dimensional laser diffraction scanner for quantifying sarcomere length variability in whole muscle sections" *World Congress of Biomechanics*, July 2014, Boston, MA.

Wong, J.D., **O'Connor, S.M.**, Selinger, J.C., Donelan, J.M. "Testing the role of blood gases in the real-time optimization of metabolic cost in human gait" *World Congress of Biomechanics*, July 2014, Boston, MA.

Inskip, J.A., Ravensbergen, R.H., **O'Connor, S.M.**, Claydon, V.E. "Spinal cord injury and disruption of extrinsic sympathetic control of cerebral vasculature does not significantly alter cerebrovascular reactivity to carbon dioxide" *Experimental Biology*, April 2014, San Diego, CA.

Inskip, J.A., Ravensbergen, R.H., **O'Connor, S.M.**, Claydon, V.E. "Methodological considerations for cerebrovascular reactivity testing and analysis" *Experimental Biology*, April 2014, San Diego, CA.

Maeda, R.S., **O'Connor, S.M.**, Donelan, J.M., Marigold, D.S. "Prior experience in the face of sensorimotor uncertainty determines adaptation to altered visual input during walking." *Society for Neuroscience Annual Meeting*, November 2013, San Diego, CA.

Inskip, J.A., Ravensbergen, R.H., **O'Connor, S.M.**, Claydon, V.E. "Can the study of individuals with autonomically-complete spinal cord injuries help to clarify the role of sympathetic nerves in cerebrovascular reactivity?" *Experimental Biology*, April 2013, Boston, MA.

O'Connor, S.M., Donelan, J.M. "Rapid visual prediction and slow optimization of preferred walking speed." *Society for Neuroscience Annual Meeting*, November 2011, Washington, DC.

O'Connor, S.M., Donelan, J.M. "Vision influences the predictive minimization of energetic cost during walking" *Dynamic Walking Conference*, July 2010, Boston, MA.

Rebula, J.R., **O'Connor, S.M.**, Kuo, A.D. "Vertical stiffness during the double support period of walking" *North American Congress on Biomechanics*, August 2008, Ann Arbor, MI.

O'Connor, S.M., Kuo, A.D. "Selection of Double Support Duration in a Compliant Walking Model" *North American Congress on Biomechanics*, August 2008, Ann Arbor, MI.

O'Connor, S.M., Kuo, A.D. "Feed-forward and feed-back components of rhythmic motor control" *Society for Neuroscience Annual Meeting*, November 2007, San Diego, CA.

Honors, Awards, Fellowships

2007, 2008: Rackham Travel Grant: University of Michigan
2005: NSF Graduate Research Fellowship: Honorable Mention
2005: Gerstacker Foundation Graduate Full Fellowship: Biomedical Engineering, Univ. of Michigan
2004: Eschenbach Memorial Award: Mechanical Engineering, Georgia Tech
2003: Petit Undergraduate Research Scholarship, Biomedical Engineering, Georgia Tech
2003: Robert Engineering Award: Outstanding Senior in Engineering, Georgia Tech
2003: ASME Auxiliary Scholarship: National ASME Merit Scholarship
2002: IEEE Hardware (Robotics) Competition: 4th Place out of 25 teams
2002: Hammock Scholarship: Mechanical Engineering, Georgia Tech
2000: Outstanding Co-op Scholarship: Motorola, Inc.
1999-2005: Georgia Tech President's Scholarship
1999-2005: Georgia Governor's Scholarship
1999-2004: Georgia Tech Dean's List and Faculty Honors
1999: National Merit Scholarship

Pending Funding

National Science Foundation: Smart and Connected Health
“Multisensor system for accurate 3D measurement of lumbar spine posture/movement with a closed loop feedback system for rehabilitation of low back pain “
Role: Co-Investigator (Sara Gombatto, Principle Investigator)
Submitted: December 2016
Award: \$1,693,099 total cost

Previous Funding

US Army Research Office: Research Grant Award, Contract #: W911NF-13-1-0268
“Control of energy minimization in human locomotion“
Role: Co-author as Postdoctoral Research Fellow (Max Donelan, Principle Investigator)
Dates: August 2013 - July 2016
Award: \$331,095 total cost

Company of Biologists Travel Grant: Society for Experimental Biology
“Sensorimotor responsiveness and resolution in the giraffe “
Principle Investigator: Shawn O'Connor
April 2010
Award: \$500 for travel

Rackham Graduate Research Grant: University of Michigan
“Visual control of walking balance“
Principle Investigator: Shawn O'Connor
April 2009
Award: \$3,000

Academic Service

Reviewer for Journal of Biomechanics, Journal of Motor Behavior, Journal of NeuroEngineering and Rehabilitation, Gait & Posture, Experimental Brain Research, Biology Letters, Transactions on Neural Systems & Rehabilitation Engineering

Co-Organizer; Dynamic Walking Annual Meeting, June 2014, Zurich, Switzerland

Biomech-L Literature Update manager (July 2014 – October 2014)

Professional Memberships

American Society of Mechanical Engineers (ASME), American Society of Biomechanics (ASB), Society for Experimental Biology (SEB), Society for Neuroscience (SFN), American College of Sports Medicine (ACSM), American Physiological Society (APS)

Research Mentor Experience

Graduate

2009-2013: Heather More, Biomedical Physiology & Kinesiology, Simon Fraser University

2009-2013: Mark Snaterse, Biomedical Physiology & Kinesiology, Simon Fraser University

2010-2013: Jessica Selinger, Biomedical Physiology & Kinesiology, Simon Fraser University

Undergraduate

2014-2015: Elton Cheng, Biomedical Engineering, UCSD

2011-2013: Renato Pagliara, Biomedical Physiology & Kinesiology, Simon Fraser University

2008-2009: Wisit Jirattigalachote, Mechanical Engineering, University of Michigan

2007-2008: Andrew Koltonow, Materials Science, University of Michigan

Graduate Student Committees

2012-2015: Rodrigo Maeda, Master's Thesis, Biomedical Physiology & Kinesiology, Simon Fraser University