

Gelsy Torres-Oviedo, Ph.D.

1. Demographic Information

a. Current Appointment

Assistant Professor of Bioengineering
Swanson School of Engineering
University of Pittsburgh
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b. Training

Gelsy Torres-Oviedo was a Ph.D. student of Prof. Lena Ting at Georgia Institute of Technology and Emory University, where she developed analytical tools for understanding the neural control of balance and the functional consequences of changes in muscle activity. She was a post-doc in the laboratory of Prof. Amy J. Bastian at Johns Hopkins University and The Kennedy Krieger Institute, where she investigated factors that enhance motor learning and generalization of locomotor adaptation, which could improve the gait rehabilitation of patients beyond the clinical setting.

c. Education

2007-11 Postdoctoral Fellow, Neuroscience, The Johns Hopkins University and Kennedy Krieger Institute
2001-07 Ph.D. in Biomedical Engineering, Georgia Institute of Technology and Emory University
1999-2001 B.S. in Physics, University of Texas at Austin

d. Professional Experience

2012- Assistant Professor of Bioengineering, The University of Pittsburgh, Pittsburgh, PA.
2007-11 Postdoctoral Fellow, Motion Analysis Laboratory, The Johns Hopkins University and Kennedy Krieger Institute, Baltimore, MD.
2001-07 Graduate Research Assistant, Neuromechanics Laboratory, Georgia Institute of Technology and Emory University, Atlanta, GA.
1999-2001 Undergraduate Research Assistant, Center for Nonlinear Dynamics, University of Texas at Austin, Austin, TX.
1997-1998 Undergraduate Research Assistant, Centro de Manufactura y Desarrollo, ITEMS Campus Monterrey, Mexico

e. Professional Memberships

2003- Society for Neuroscience
2005- Society for The Neural Control of Movement
2011- American Physiological Society
2004-2005 American Society of Biomechanics
2007-2008 International Society for Posture and Gait Research
2012- American Heart Association

2. Research Activities

a. Peer-reviewed Articles (H-index = 6)

1. Finley J., Long A., Bastian A.J., and **Torres-Oviedo, G.** Spatial and Temporal Contributions to Step Length Asymmetry: Applications to Split-Belt Adaptation and Hemiparetic Gait. (*under review*)
2. Chvatal SA, Macpherson JM, **Torres-Oviedo G**, Ting LH. (2013) Absence of postural muscle synergies for balance following spinal cord transection. *J Neurophysiol.* 2013 Sep;110(6):1301-10
3. Malone, L. A., Bastian, A. J., and **Torres-Oviedo, G.** (2012). How does the motor system correct for errors in time and space during locomotor adaptation? *Journal of neurophysiology.* 108(2):672-83.
4. **Torres-Oviedo G.** and Bastian A.J. (2012). Natural error patterns enable transfer of motor learning to novel contexts. *Journal of Neurophysiology.* 107(1):346-56.
5. **Torres-Oviedo G.**, Vasudevan E.V.L., Malone L.A., and Bastian A.J. (2011). Locomotor adaptation. Enhancing Performance for Action and Perception. *Progress in Brain Research.* 191:65-75.
6. Safavynia A.S., **Torres-Oviedo, G.**, and Ting H.L. (2011). Muscle synergies: implications for clinical evaluation and rehabilitation of movement. *Topics in Spinal Cord Injury Rehabilitation.* 17(1):16-24.
7. Chavatal S.A., **Torres-Oviedo G.**, Safavynia A.S., and Ting H.L. (2011). Common muscle synergies for control of center of mass and force in non-stepping and stepping postural behaviors. *Journal of Neurophysiology.* 106(2):999-1015
8. Vasudevan E.V.L, **Torres-Oviedo G.**, Morton S.M., Yang J.F., Bastian A.J. (2011). Younger is not always better: development of locomotor adaptation from childhood to adulthood. *Journal of Neuroscience.* 23;31(8):3055-65
9. **Torres-Oviedo G.** and Bastian A.J. (2010). Seeing is believing: effects of visual contextual cues on learning and transfer of locomotor adaptation. *Journal of Neuroscience.* 30(50):17015-22
10. **Torres-Oviedo G.** and Ting L.H. (2010). Subject-specific muscle synergies in human balance control are consistent across different biomechanical contexts. *Journal of Neurophysiology* 103(6):3084-98
11. **Torres-Oviedo G.** and Ting L.H. (2007). Muscle synergies characterizing human postural responses. *Journal of Neurophysiology* 98(4):2144-2156.
12. **Torres-Oviedo G**, Macpherson JM, Ting LH. (2006). Muscle synergy organization is robust across a variety of postural perturbations. *Journal of Neurophysiology.* 96:1530-1546.
13. Lin A.L., Mann B.A., **Torres-Oviedo G.**, Lincoln B., Käs J., and Swinney H. L. (2004). Localization and Extinction of Bacterial Populations under Inhomogeneous Growth Conditions. *Biophysical Journal* 87: 75-80.

b. Manuscripts in preparation

1. **Torres-Oviedo, G.** Vasudevan E.V.L., Malone L.A., and Bastian A.J., Context-specificity in motor learning is developed during childhood

c. Book Chapters

1. Vasudevan E.V.L, Bastian A.J., and **Torres-Oviedo G.** (2010). Emerging principles in the learning and generalization of new walking patterns. *Motor*

Control: Theories, Experiments, and Applications. Frederic Danion and Mark Latash. Oxford University Press.

d. Conference Proceedings

1. Ting L.H. and **Torres-Oviedo G.**, Muscle synergies simplifying neural control of posture. *FASEB Journal*, 2007 Experimental Biology Annual Meeting on April 28th-May 2nd, 2007; 21(5):A463-A465
2. **Torres-Oviedo G.**, Macpherson J.M., Ting L.H. Muscle synergies robustly control forces for balance control. *Neural Engineering 2005 Conference Proceedings. 2nd International IEEE EMBS Conference* on March 16-19, 2005: 190-191

e. Presentations in Scientific Meetings (For the past five years)

Oral Presentations

1. **Torres-Oviedo, G.**, Bastian A. J., and Finley J., (2013). Analytical decomposition of gait kinematics reveals spatial and temporal sources of step length asymmetry post-stroke. DynamicWalking Conference. Pittsburgh, PA.
2. **Torres-Oviedo G.**, Malone L.A., and Bastian A.J. (2010) *Multiple adaptation rates underlie differences in spatial and temporal adaptation of task space variables in human locomotion*
Invited speaker as part of the symposium in Locomotion Session within Track 3.6. in World Congress of Biomechanics. Singapore.
3. **Torres-Oviedo, G.**, Trzcinski N.K, .and Bastian A. J. (2009). *How does the error driving the adaptation affect the generalization of a new locomotor pattern*
as part of the nanosymposium Session 702 Mechanisms of human motor learning. Society for Neuroscience Annual Meeting. Chicago, IL.
4. **Torres-Oviedo G.**, and Bastian A.J. (2009) *Seeing is believing: effects of vision and uncertainty on generalization of trained walking patterns:*
Invited speaker as part of the workshop: "Walking outside the box: new views on locomotion" in Neural Control of Movement 19th Annual Conference, Hawaii HI.

Poster Presentations

1. Harker H. M., Sombric C. J., Sparto P. J., and **Torres-Oviedo, G** (2014) Large movement errors during split-belt locomotor adaptation do not affect the generalization of learning to natural walking in older adults. Society for Neuroscience. Washington, DC.
2. Sombric C. J., Harker H. M., Sparto P. J., and **Torres-Oviedo, G.** (2014). You only get better with age: age predisposes one to learn new movements slower but to carryover more of what is learned to novel situations. Society for Neuroscience. Washington, DC.
3. Finley J., Long A., Bastian A.J., and **Torres-Oviedo, G.** (2014) Spatial and Temporal Contributions to Step Length Asymmetry: Applications to Split-Belt Adaptation and Hemiparetic Gait. 7th World Congress of Biomechanics. Boston, MA
4. Harker H. M., Sombric C. J., Sparto P. J., and **Torres-Oviedo, G** (2014). Large movement errors during split-belt locomotor adaptation do not affect the generalization of learning to natural walking in older adults. Society for Neuroscience. Pittsburgh, PA.
5. Sombric C. J., Harker H. M., Sparto P. J., and **Torres-Oviedo, G.** (2014). You only get better with age: age predisposes one to learn new movements slower

- but to carryover more of what is learned to novel situations. Rehabilitation Institute Research Day. Pittsburgh, PA.
6. Iturralde P. A, Ting L. H., Bastian A. J., and **Torres-Oviedo, G.** (2013). Learning with pre-existing muscle synergies during human split-belt walking. Society for Neuroscience. San Diego, CA.
 7. **Torres-Oviedo, G.**, Bastian A. J., and Finley J., (2011). Exploring contributions of temporal and spatial strategies to symmetry in human locomotion. Neural Control of Movement. San Juan, PR.
 8. **Torres-Oviedo, G.** Vasudevan, E.V.L, Malone L.A., and Bastian A.J., (2010). Context-specificity of locomotor adaptation developed during childhood. Neural Control of Movement. Key Biscayne, FL.
 9. Vasudevan E. V. L, **Torres-Oviedo, G.**, Yang J. F., and Bastian A. J. (2009). Development of motor learning from childhood to adulthood. Society for Neuroscience. Chicago, IL.
 10. Malone L.A., Bastian A.J., and **Torres-Oviedo, G.** (2009) Multiple adaptation rates underlie differences in spatial and temporal adaptation of human locomotion. Neural Control of Movement. Kona, HI.

f. Invited Lectures (For the past five years)

1. Pitt-CMU Bipedal Locomotion Seminar, Carnegie Mellon University, (2013). *How does the motor system correct for errors in space and time?*
2. McGowan Institute for Regenerative Medicine, The University of Pittsburgh, (2013). *Generalization of motor learning: can robotic-assisted learning transfer to natural movements?*
3. Department of Physical Therapy, The University of Pittsburgh, (2012). *Generalization of motor learning: can learning acquired on a treadmill transfer to natural walking?*
4. Department of Bioengineering, The University of Pittsburgh, (2012). *Principles for the flexibility in locomotion: from motor adaptation to balance control*
5. Department of Physical Medicine and Rehabilitation, Panther Rehab Rounds Lecture. The University of Pittsburgh, (2012). *Understanding locomotor adaptation for the rehabilitation of gait.*
6. Department of Bioengineering, The University of Pittsburgh, (2011) *Understanding locomotor adaptation for the rehabilitation of gait*
7. Department of Bioengineering, The University of Pennsylvania, (2011). *Understanding locomotor adaptation for the rehabilitation of gait*
8. Department of Electrical Engineering, Carnegie Mellon University, (2011) *Understanding locomotor adaptation for the rehabilitation of gait*
9. Shriners Hospitals Pediatric Research Center, Temple University School of Medicine, (2011) *Factors that make motor learning acquired on a treadmill transfer to natural walking*
10. National Rehabilitation Institute (2011) *Understanding motor adaptation for the rehabilitation of gait and balance*
11. Division of Biokinesiology and Physical Therapy, The University of Southern California, (2010) *Understanding motor adaptation for the rehabilitation of gait and balance*
12. Sensorimotor seminar, Johns Hopkins University, (2010) *Out-of-the ordinary errors limit the generalization of device-induced learning*
13. Department of Kinesiology, Penn State University, (2010) *Understanding standing balance and generalization of gait adaptation in humans*
14. Department of Mechanical Engineering, The University of Delaware, (2010) *Principles for the control of locomotion: From balance control to motor adaptation*

15. Center for Neural Repair and Rehabilitation, Temple University School of Medicine, (2010) *Understanding motor adaptation for the rehabilitation of gait and balance*
16. Department of Biomedical Physiology and Kinesiology, Simon Fraser University, (2009) *From the role of balance control to motor adaptation in locomotion*
17. School of Biomedical Engineering, Drexel University, (2009) *Principles for the control of locomotion: From balance control to motor adaptation*
18. Panelist in motor learning and computational models sections (2009). As part of the NIH workshop: *Promoting generalization in Stroke Rehabilitation* Rockville, MD.

3. Sponsorships

a. Current

1. "Understanding locomotor plasticity in older adults"
Claude Pepper Center at the University of Pittsburgh
Funding period: 2013 to 2015
Total direct costs: \$25,000
PI: Gelsy Torres-Oviedo, 20% effort
2. "Understanding the generalization of treadmill-assisted motor learning for gait rehabilitation after stroke"
National Science Foundation, BRIGE program
Funding period: 2013 to 2015
Total direct costs: \$116,584
PI: Gelsy Torres-Oviedo, 10% effort
3. "Understanding what forces applied by the motor system restore walking symmetry"
Central Research Development Fund at The University of Pittsburgh
Funding period: 2013 to 2014
Total direct costs: \$16,000
PI: Gelsy Torres-Oviedo, 20% effort

b. Pending

1. "Understanding the generalization of treadmill-assisted motor learning towards improving gait rehabilitation after stroke"
American Heart Association, National Scientist Development Grant
Funding period: 2013 to 2017
Total direct costs: \$308,000
PI: Gelsy Torres-Oviedo, 22% effort
2. "Understanding the generalization of treadmill-assisted motor learning towards improving gait rehabilitation after stroke"
American Heart Association, Great Rivers Scientist Development Grant
Funding period: 2013 to 2015
Total direct costs: \$132,000
PI: Gelsy Torres-Oviedo, 18% effort

c. Completed

1. "Interrelationships among quantitative measures of white matter injury, sensorimotor function, and learning profiles in children with cerebral palsy"
Reaching for the Stars
Funding period: 2008 to 2010

Total direct costs: \$20,000
Co-PI: Gelsy Torres-Oviedo
PI: Michael V. Johnson, Kennedy Krieger Institute

d. Submitted

1. "Identifying patient-specific deficits underlying step asymmetry post-stroke towards developing personalized treatments"
American Heart Association, National Scientist Development Grant
Funding period: 2014 to 2018
Total direct costs: \$308,000
PI: Gelsy Torres-Oviedo, 20% effort
2. "Understanding patient-specific deficits causing step asymmetry post-stroke: a step towards personalizing rehabilitation"
American Heart Association, Great Rivers Scientist Development Grant
Funding period: 2014 to 2017
Total direct costs: \$231,000
PI: Gelsy Torres-Oviedo, 20% effort
3. "Using muscle-driven forward dynamic simulations to understand the locomotor plasticity of cerebral palsy towards improving gait rehabilitation"
National Center for Simulation in Rehabilitation Research
Funding period: 2013 to 2014
Total direct costs: \$25,000
PI: Gelsy Torres-Oviedo, 20% effort
4. "Identifying patient-specific deficits underlying gait asymmetry post-stroke towards developing personalized treatments"
American Heart Association, National Scientist Development Grant
Funding period: 2014 to 2017 (4 years)
Total direct costs: \$308,000
PI: Gelsy Torres-Oviedo, 22% effort
5. "Identifying different sources of gait asymmetry post-stroke: a step towards personalized treatments"
American Heart Association, Great Rivers Beginning Grant-in-Aid
Funding period: 2014 to 2015 (2 years)
Total direct costs: \$132,000
PI: Gelsy Torres-Oviedo, 18% effort
6. "Understanding the generalization of treadmill-assisted motor learning towards improving gait rehabilitation after stroke"
American Heart Association, National Scientist Development Grant
Funding period: 2013 to 2017
Total direct costs: \$308,000
PI: Gelsy Torres-Oviedo, 22% effort
7. "Understanding the generalization of treadmill-assisted motor learning towards improving gait rehabilitation after stroke"
American Heart Association, Great Rivers Beginning Grant-in-Aid
Funding period: 2013 to 2015
Total direct costs: \$132,000
PI: Gelsy Torres-Oviedo, 18% effort

8. "Understanding locomotor plasticity in older adults"
Aging Institute at The University of Pittsburgh
Funding period: 2012 to 2013
Total direct costs: \$20,000
PI: Gelsy Torres-Oviedo, 20% effort
9. "Understanding the locomotor plasticity in cerebral palsy for gait rehabilitation"
Central Research Development Fund at The University of Pittsburgh
Funding period: 2013 to 2014
Total direct costs: \$16,000
PI: Gelsy Torres-Oviedo, 20% effort

4. Teaching

1. Dynamical Systems (BioE 1255). Department of Bioengineering, University of Pittsburgh, Pittsburgh, PA. I have served as alternate instructor during the Spring 2014 term. Responsibilities: Instructor during laboratory sessions and lecturer in the absence of main instructor. Enrollment: 76 students.
2. Learning and Control of Movement (BioE 2650). Department of Bioengineering, University of Pittsburgh, Pittsburgh, PA. I taught this course in Fall 2013. Responsibilities: Developed problems and solutions for homeworks, quizzes, and exams. Developed syllabus and I was main lecturer during the entire semester. Enrollment: 15 students.
3. Freshman Seminar (ECFS190-001). Chemistry Department, Emory University. Atlanta, GA. I taught this course in Spring and Fall 2006. Responsibilities: Developed syllabus and taught 3-week modules based on PhD research. Enrollment: ~20 students.
4. Biomechanics (BME 3400). Biomedical Engineering Department, Georgia Institute of Technology, Atlanta, GA. I was Teaching assistant for this course in Spring 2003 and Spring 2004. Responsibilities: Developed problems and solutions for homeworks, quizzes, and exams. Lecturer during problem solving sections. Enrollment: ~40 students.

5. Mentoring

a. Undergraduate Students (research mentor)

1. Harrison M Harker, B.S. Bioengineering student at The University of Pittsburgh. Lab member since Summer of 2013. Research on "Understanding locomotor plasticity in older adults".
2. Thomas William Rothella, B.S. Bioengineering student at The University of Pittsburgh. Lab member since Fall of 2012. Research on "Effects of self-induced variability in Children and Stroke Patients".
3. Jonathan S. Calvert, B.S. Bioengineering student at The University of Pittsburgh. Lab member since Fall of 2012. Research on "Adaptation of end-point forces and moments during walking".
4. Erica Brunngraber, B.S. BioE student at The University of Pittsburgh. Lab member in summer of 2012. Research on "Locomotor adaptation in Cerebral Palsy Children".
5. Sara Tankard, B.S. in BME Department at The University of Pittsburgh. Lab member in the Motion Analysis Laboratory directed by Prof. Amy J. Bastian. Research on "Structural Learning in Locomotor adaptation".

b. Graduate Students (research mentor)

1. Carly Sombric. Current Ph.D. student in Bioengineering. Ms. Sombric was awarded the Bevier Awards from the University of Pittsburgh.
2. Pablo A. Iturralde, MS. Current Ph.D. student in Bioengineering. Mr. Iturralde was awarded a Fulbright Scholarship and a Fellowship from the Organization of American States.
3. Laura A. Malone, Ph.D. in BME completed on May 2011. She was a lab member in the Motion Analysis Laboratory directed by Prof. Amy J. Bastian. I closely mentored Laura in one of her studies. As a result we published a paper in the Journal of Neurophysiology and Prof. Bastian suggested that I should be senior author because of my critical mentoring role.

6. Service Activities

a. Editorial Activities

1. Guest Associate editor for PLOS in Computational Biology

b. Journal Review member

2. Journal of Neurophysiology
3. Experimental Brain Research
4. Journal of Biomechanics
5. Frontiers in Computational Neuroscience
6. Journal of Motor Control
7. F1000Research
8. Elifesciences
9. IEEE/Transactions on Neural Systems & Rehabilitation Engineering

c. Grant reviewer

1. College of Reviewers for the Perception, Action, and Cognition (PAC) program in the National Science Foundation.

d. Organizational activities

1. Leader in the development of the Pre-PhD Research Experience at Pitt (PREP) program between The Department of Bioengineering and the University of Pittsburgh and the School of Engineering at The University of Turabo, Puerto Rico
2. Leader in the development of Human Movement Laboratory formed across the Swanson School of Engineering and the School of Health Rehabilitation and Sciences
3. Chair at the Sensorimotor Integration and Motor Control Social as part of The Society for Neuroscience Meeting in 2011 at Washington DC.
4. Vice-president in public relations and international affairs at The Johns Hopkins Postdoctoral Association during Fall 2008 to Summer 2009
5. Vice-president in communications at The Johns Hopkins Postdoctoral Association during Fall 2007 to Summer 2008

e. Outreach

1. Guest speaker on February 2009 at Ciencia 3x7 radio show promoting the dissemination of science in Mexico.
2. Guest speaker on December 2007 at Ciencia 3x7 radio show promoting the dissemination of science in Mexico.
3. Participated in Discover Graduate Education event organized by the Diversity Office under the direction of Associate Dean Wosu.

7. Awards and Honors

- 2010 Student Travel Award, 6th World Congress of Biomechanics
- 2010 Selected participant at NSF ADVANCE Junior Faculty Development Workshop
- 2010 Hon. Ruth D. Vogel Award
- 2007 Selected participant at NSF ADVANCE Women in Science and Engineering workshop for emerging faculty
- 2006 Howard Hughes Teacher-Scholar in ORDERS/INSPIRE program at Emory University
- 1999 Natural Sciences College Scholar, University of Texas at Austin
- 1999 Jeannie Hunter Hackett Award
- 1996-99 Outstanding Undergraduate Scholarship ITESM Campus Monterrey