

Natalia Sánchez, Ph.D.

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Los Angeles, CA 90033

ACADEMIC APPOINTMENTS

Assistant Professor of Research

May 2019 – Present

Division of Biokinesiology and Physical Therapy
University of Southern California
Los Angeles, CA 90033

EDUCATION

University of Southern California

Los Angeles, CA

Certificate in Clinical, Biomedical and Translational Investigations
Keck School of Medicine, Department of Preventive Medicine

Sept. 2019 – December 2020

University of Southern California

Los Angeles, CA

Postdoctoral research fellow, Biokinesiology and Physical Therapy

September 2015 – April 2019

Northwestern University

Evanston, IL

Doctor of Philosophy, Biomedical Engineering, Neural Engineering Track

September 2015

McCormick School of Engineering, Department of Physical Therapy and Human Movement Sciences

Advisor: Julius P.A. Dewald

Dissertation: Abnormal Static and Dynamic Joint Torque Patterns in the Lower Extremities of Individuals with Chronic Hemiparetic Stroke

Northwestern University

Evanston, IL

Masters of Science, Biomedical Engineering

December 2012

McCormick School of Engineering

Thesis: A multiple degree of freedom lower extremity isometric device to simultaneously quantify hip, knee, and ankle torques

Universidad EIA – Universidad CES

Medellín, Colombia

Bachelor of Science, Biomedical Engineering

January 2008

SCHOLARLY ACTIVITY – FUNDING RECEIVED

Ongoing Research Support

NCMRR P2CHD065702 (Sánchez PI)

07/01/2020-06/30/2021

Center for Large Data Research & Data Sharing in Rehabilitation (CLDR) Pilot Project Program

“Stroke Initiative for Gait Data Evaluation (STRIDE)”

Role: Principal Investigator

8/13/2020

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NCATS KL2TR001854 (Sánchez PI)

06/01/2019-05/31/2022

“Development and application of big data techniques to gait analysis: dissociating recovery from compensation during gait in individuals post-stroke”

Role: Principal Investigator

Completed Research Support

USC CTSI Clinical Research Pilot Award (Finley PI)

06/01/2018-05/31/2019

“Clinical and Behavioral Assessment of Fall Risk during Walking in People Post-Stroke”

Role: Co-Investigator

American Heart Association (Sánchez PI)

06/01/2016-05/31/2018

Postdoctoral Fellowship 16POST29610000

“Is asymmetry optimal? Characterization of Individual Differences in the Metabolic Cost of Asymmetry Post-Stroke”

Role: Principal Investigator

American Heart Association (Sánchez PI)

01/01/2013-12/31/2014

Pre-doctoral Fellowship 13PRE14690048

Lower Extremity Synergies After Hemiparetic Stroke

Role: Pre-doctoral Fellow

Awards

USC CTSI Research voucher (2020)

Use of automated trial promoter for participant recruitment

Summer Program in Data Curation for Rehabilitation Research and Related Clinical Trials offered by the Inter-university Consortium for Political and Social Research (ICPSR) (2018)

Full Scholarship

Society for the Neural Control of Movement (2018)

Under-represented minorities' diversity fellowship

Honors Student - Escuela de Ingenieria de Antioquia (2008)

PUBLICATIONS

In preparation

N Sánchez, CJ Winstein. Lost in translation: reassessing stroke neurorehabilitation research from a top-down approach (In Preparation).

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N Sánchez, N Schweighofer, JM Finley. Simultaneous dimensionality reduction and regression in gait analysis: an application to understanding different step length asymmetries post-stroke (In Preparation).

S Park, C Liu, N Sánchez, JK. Tilson, SJ. Mulroy, and JM. Finley. Using biofeedback to reduce spatiotemporal asymmetry impairs dynamic balance in people post-stroke. Under Revision.

Published Manuscripts

N Sánchez, S Simha, JM Donelan, JM Finley. Using asymmetry to your advantage: learning to acquire and accept external assistance during prolonged split-belt walking. BiorXiv 2020.

N Sánchez, S Simha, JM Donelan, JM Finley. Taking advantage of external mechanical work to reduce metabolic cost: the mechanics and energetics of split-belt treadmill walking. The Journal of Physiology (2019).

F Pozzi, HA Plummer, N Sánchez, Y Lee, LA Michener. Electromyography activation of shoulder and trunk muscles is greater during closed chain compared to open chain exercises. Journal of Electromyography and Kinesiology (2019).

N Sánchez, AM Acosta, R Lopez-Rosado, JPA Dewald. “Neural Constraints Affect the Ability to Generate Hip Abduction Torques When Combined with Hip Extension or Ankle Plantarflexion in Chronic Hemiparetic Stroke” Frontiers in Neurology 9, no. July (2018).

N Sánchez, JM Finley. Individual Differences in Locomotor Function Predict the Capacity to Reduce Asymmetry and Modify the Energetic Cost of Walking Post-Stroke” Neurorehabilitation and Neural Repair (2018).

N Sánchez, S Park, JM Finley. Evidence of Energetic Optimization during Adaptation Differs for Metabolic, Mechanical, and Perceptual Estimates of Energetic Cost. Scientific Reports 7 (2017).

N Sánchez, AM Acosta, R Lopez-Rosado, AHA Stienen, JPA Dewald. Lower Extremity Motor Impairments in Ambulatory Chronic Hemiparetic Stroke: Evidence for Lower Extremity Weakness and Abnormal Muscle and Joint Torque Coupling Patterns. Neurorehabilitation and neural repair 31.9 (2017).

N Sánchez, AM Acosta, AHA Stienen, JPA Dewald . A multiple degree of freedom lower extremity isometric device to simultaneously quantify hip, knee, and ankle torques. IEEE Trans. Neural Syst. Rehabil. Eng. (2015).

N Sánchez, JPA Dewald. Constraints imposed by the lower extremity extensor synergy in chronic hemiparetic stroke: Preliminary findings. In: Engineering in Medicine and Biology Society (EMBC), 2014 36th Annual International Conference of the IEEE (2014).

ABSTRACTS

Conference presentations

N Sanchez, SN. Simha, JM Donelan, and JM. Finley: Using Visual Guidance to Acquire Work From the Treadmill During Split-belt Walking Does Not Accelerate Adaptation. Virtual American Society for Biomechanics, 2020.

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N Sanchez, SN. Simha, JM Donelan, and JM. Finley: Is more better? Evaluating the role of time in energy optimization during split-belt adaptation. Dynamic Walking. Canmore, Alberta. Canada 2019.

N Sánchez, S Simha, JM Finley, JM Donelan. Exploiting Asymmetry to Gain Assistance during Split-belt Treadmill Walking. Advances in Motor Learning & Motor Control. San Diego, CA. November, 2018

N Sánchez, Simultaneous dimensionality reduction and regression to draw inference in gait analysis: an application to understanding gait asymmetry post-stroke. Submitted for World Congress of Biomechanics. Dublin, Ireland. July 2018.

N Sánchez, S Simha, JM Finley, JM Donelan. Experimental Analysis and Model-Based Predictions of Work Minimizing Strategies for Split-belt Walking. Dynamic Walking, Pensacola, FL 2018.

J.M. Finley, Chang Liu, and **N. Sanchez**. (2017). Mapping the Influence of Spatiotemporal Asymmetries on Energetic Cost and Reactive Balance during Walking. Dynamic Walking Conference in Mariehamn, Sweden.

N Sanchez. “Explicit modification of step length asymmetry transfers to over-ground walking post-stroke”. American Society of Biomechanics, Boulder, CO 2017.

N Sánchez. “Volitional Coupling of Hip Extension with Hip Abduction is Altered Post-Stroke”. World Congress of Biomechanics. Boston, MA. July 2014. Invited Speaker.

N Sánchez. “Spontaneous Extension-Adduction Coupling in the Post-Stroke Lower Extremity: Implications for Rehabilitation”. Biomedical Engineering Society Annual Meeting. Seattle, WA. September 2013.

Peer-reviewed abstracts

C Liu, S Park, **N Sánchez**, JK. Tilson, SJ. Mulroy, and JM. Finley. Asymmetries in the Reactive Control of Angular Momentum during Post-stroke Gait. International Society for Biomechanics. Calgary, Alberta. Canada. July, 2019

S Park, C Liu, **N Sánchez**, JK. Tilson, SJ. Mulroy, and JM. Finley. Impact of Modifying Spatiotemporal Asymmetry on Dynamic Balance during Walking Post-Stroke. Calgary, Alberta. Canada. July, 2019

F Pozzi, HA Plummer, **N Sánchez**, Y Lee, LA Michener. Closed chain exercises of the upper extremity elicit greater activation of shoulder and trunk muscles. Combined Sections Meeting, Washington, DC 2019.

N Sánchez. Combined dimensionality reduction and regression to identify correlates of step length asymmetry post-stroke. Society for the Neural Control of Movement, Santa Fe, NM, May 2018.

T Sukal-Moulton, **N Sánchez**, JPA Dewald. Simultaneous isometric joint torques measurement in the lower extremities of children and adults. American Academy for Cerebral Palsy and Developmental Medicine. Montreal, Canada. September 2017.

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N Sánchez, S Park, J.M. Finley. Symmetry is Not Always Optimal: Mapping the Metabolic Cost Landscape of Walking on a Split-belt Treadmill. Society for the Neural Control of Movement. Montego Bay, Jamaica. April 2016. (Poster presentation).

S Park, **N Sánchez**, J.M. Finley. Modifying Adaptive Locomotor Learning using Body Weight Support. Society for the Neural Control of Movement. Montego Bay, Jamaica. April 2016. (Poster presentation).

R. Lopez-Rosado, **N Sánchez**, S. Adkins, M. Gordon, C. Montejano, JPA. Dewald. “Does Supine vs. Standing Posture Change Joint Torque Coupling Patterns in the Paretic Lower Extremity?” American Physical Therapy Association (APTA) Combined Sections Meeting. Las Vegas, NV. February 2014. (Poster presentation).

Non-peer reviewed abstracts

N Sánchez, SN Simha, JM Donelan, J.M. Finley. Prolonged exposure to split-belt walking promotes energy optimization during locomotor adaptation. Society for Neuroscience – Annual Meeting, Chicago IL, October 2019. (Poster presentation).

C. Liu, S. Park, **N. Sánchez**, J.K. Tilson, S.J. Mulroy, and J. M. Finley (2019), Altering Spatiotemporal Asymmetry Influences the Reactive Control of Balance During Walking in People Post-stroke. Society for Neuroscience – Annual Meeting, Chicago IL, October 2019. (Poster presentation).

S. Park, C. Liu, **N. Sánchez**, J.K. Tilson, S.J. Mulroy, and J. M. Finley (2019), Impact of Modifying Spatiotemporal Asymmetry on Frontal Plane Whole-body Angular Momentum during Walking Post-stroke. Society for Neuroscience – Annual Meeting, Chicago IL, October 2019. (Poster presentation).

JM. Finley, **N Sánchez**, CJ Winstein Y Gerasimenko, D Sayenko, VR Edgerton. Transcutaneous spinal stimulation modulates overground walking performance in individuals post-stroke. Society for Neuroscience – Annual Meeting, Chicago IL, October 2019. (Poster presentation).

Y Gerasimenko, D Sayenko, **N Sánchez**, JM. Finley, VR Edgerton. Transcutaneous spinal cord stimulation facilitates stepping performance in stroke patients. Society for Neuroscience – Annual Meeting, Chicago IL, October 2019. (Poster presentation).

N Sánchez, L Trejo, J.M. Finley. The capacity to modify asymmetry and reduce metabolic cost in people post-stroke depends on the direction of baseline asymmetry. Society for Neuroscience – Annual Meeting, Washington DC. November 2017. (Poster presentation).

N Sánchez, S Park, J.M. Finley. Perceptual, physiological and neuromechanical correlates of effort associated with step-length manipulations during split-belt walking. Society for Neuroscience – Annual Meeting, San Diego, CA. November 2016. (Poster presentation).

N. Sánchez, A.C. Dragunas, K.E. Gordon, J.P.A. Dewald. Effects of Abnormal Post-Stroke Extension/Adduction Coupling in the Lower Extremity During Gait Initiation: Preliminary Results. Society for Neuroscience – Annual Meeting, Chicago, IL. October 2015. (Poster presentation).

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Hurley D, Hrubby S, Joshi , Kang HW, Thompson CK, Miller LC, **Sanchez N**, Powers RK, Negro F, Farina D, Dewald JP, Heckman CJ. Mapping the discharge of motor unit populations in the human lower extremity. Society for Neuroscience – Annual Meeting, Chicago, IL. October 2015. (Poster presentation).

J. Yao, **N. Sánchez**, M. Owen, C. Carmona, J. Sullivan, JPA. Dewald. Sensorimotor Changes After an Intervention Using a Novel Assistive System – Rein Hand: A Case Report. American Society for Neurorehabilitation, Chicago, IL 2015. (Poster presentation).

N Sánchez, JPA Dewald. “Effect of paretic ankle plantarflexion in spontaneous and voluntary joint torque coupling patterns”. Society for Neuroscience – Annual Meeting, Washington, DC. November 2014. (Poster presentation)

MA Owen, **N Sánchez**, JPA Dewald. “Cortical representation in the internal capsule in chronic stroke: preliminary results from a diffusion tensor study”. Society for Neuroscience – Annual Meeting, San Diego, CA. November 2013. (Poster presentation)

N Sánchez, R Lopez-Rosado, JPA Dewald. “Increased hip adductor, as opposed to reduced hip abductor activity, may explain hip abductor weakness during isometric hip extension in the paretic lower extremity following stroke”. Society for Neuroscience – Annual Meeting, San Diego, CA. November 2013. (Poster presentation).

N Sánchez, JPA Dewald. “Preliminary evidence for hip extension-adduction joint torque coupling in the lower extremity post-stroke”. Society for Neuroscience – Annual Meeting, New Orleans, LA. October 2012. (Poster presentation).

N Sánchez, RL Hawe, JPA Dewald. “Assessment of reproducibility and sensitivity of corticospinal tract DTI derived metrics in stroke”. Society for Neuroscience – Annual Meeting, San Diego, CA. November 2010. (Poster presentation).

RL Hawe, **N Sánchez**, JPA Dewald. “Reliability of Diffusion Tensor Imaging Measures in Subjects with and without Stroke”. Annual Meeting of the Organization for Human Brain Mapping. Barcelona, Spain. June 2010. (Poster presentation).

INVITED TALKS AND PRESENTATIONS

Division of Biokinesiology and Physical Therapy Neurorehabilitation Seminar.

Is More Better? Evaluating the Role of Experience in Energy Optimization during Split-Belt Adaptation. Los Angeles, CA September 2019.

California Physical Therapy Association.

Cutting Edge Evidence: Everything a Practicing Clinician Needs to Know to Improve Outcomes After Stroke. Split-belt training after stroke and FES+Fast walking. Case presentation on exploration after stroke. Long Beach, CA. April 2019.

TEACHING EXPERIENCE

Natalia Sánchez, Ph.D.

- Matlab Programming Bootcamp Summer 2019
Instructor. Neuroscience Graduate Program. University of Southern California
- Neuroanatomy Fall 2018 - Present
Instructor. Division of Biokinesiology and Physical Therapy, University of Southern California
- Technology in Sport: Field Assessment of Athletic Performance Spring 2018 – Present
Course Director. Sports Science Program. Division of Biokinesiology and Physical Therapy, University of Southern California
- Biophysical Signal Processing Winter 2012, 2014
Teaching Assistant. Northwestern University's Interdepartmental Neuroscience Program
- Neuroanatomy Laboratory Winter 2013
Instructor. Department of Physical Therapy and Human Movement Sciences, Northwestern University
- Physical Therapy Graduate Project Advisor. Fall 2011 – Winter 2013
Department of Physical Therapy and Human Movement Sciences, Northwestern University
- Advanced Systems Physiology: Neuroscience Fall 2010
Teaching Assistant. Department of Biomedical Engineering, Northwestern University

MENTORING EXPERIENCE

- Catherine Yunis 2020 – Present
PhD Student. Biomedical Engineering
University of Southern California
- Camille Grandjean 2019 – 2020
Undergraduate Biomedical Engineering Student. University of Southern California
Using visual guidance to acquire work from the treadmill during split-belt walking does not accelerate adaptation
- Noah Tristan 2019 – 2020
Undergraduate Biomedical Engineering Student. University of Southern California
Using visual guidance to acquire work from the treadmill during split-belt walking does not accelerate adaptation
- Suzanne Adkins, Matthew Gordon, Cynthia Montejano 2013-2014
Doctorate of Physical Therapy Students at Northwestern University.
Effect of supine vs. standing posture in joint torque coupling patterns in the paretic lower extremity

PEER REVIEWER

American Heart Association
Journal of Applied Biomechanics

8/13/2020

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Gait and Posture
Neurorehabilitation and Neural Repair
Journal of Neurophysiology
Journal of Neurorehabilitation Engineering
Transactions in Biomedical Engineering
Neuroscience
Frontiers in Neuroscience
Frontiers in Neurology
Transactions in Neural Systems and Rehabilitation Engineering
The Journal of Physiology
Royal Society Open Science
Experimental Gerontology

COMMUNITY SERVICE AND LEADERSHIP

Leader International Students Affinity group Division of Biokinesiology and Physical Therapy, the University of Southern California	June 2020 - Present
Organizer USC National Biomechanics Day	April 2019
Mentor STEM Goes Red, American Heart Association Mentoring of female high school students in the greater LA area with interest in STEM careers	January 2018 – Present
Newsletter Contributor. Association for Women in Science	Sept 2013 – Sept 2016
Science Club Mentor. Mentoring in science of middle school kids for Chicago Public Schools and McCormick Boys & Girls Club.	Sept 2013 – May 2015
Northwestern University Brain Awareness Organization. Chicago Public Schools teacher training in neuroscience.	Apr 2013 – Aug 2015

SOCIETIES AND MEMBERSHIPS

Society for Neuroscience	2009 – Present
American Heart Association	2012 – Present
Association for Women in Science	2013 – Present
Society for the Neural Control of Movement	2016 – Present
American Society of Biomechanics	2017 – Present
American Society for Neurorehabilitation	2018 – Present