

# **CURRICULUM VITAE**

**Jason J. Kutch**

**September 29, 2022**

## **I. BIOGRAPHICAL INFORMATION**

### **PERSONAL INFORMATION:**

**University Address:** Herman Ostrow School of Dentistry of USC  
Division of Biokinesiology and Physical Therapy  
1540 E. Alcazar Street  
CHP 155 Los Angeles, CA 90033  
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### **BRIEF BIOGRAPHY:**

Jason J. Kutch, PhD, is an associate professor in the Division of Biokinesiology and Physical Therapy at the University of Southern California. He teaches neuroscience in the USC Doctor of Physical Therapy program, and is the director of the Applied Movement & Pain Laboratory (AMPL) at USC. Dr. Kutch received his bachelor's degree in Mechanical Engineering from Princeton University in 2001, and his Ph.D. in Applied Mathematics from the University of Michigan in 2008. Dr. Kutch's work is at the intersection of chronic pain and movement control. He is particularly interested in how the nervous system controls pelvic floor muscles, as well as how brain dysfunction contributes to chronic pelvic pain and other chronic overlapping pain conditions (COPCs). His current research is focused on developing non-invasive brain stimulation approaches for augmenting chronic pain treatment.

### **EDUCATION AND PROFESSIONAL APPOINTMENTS:**

#### **EDUCATION:**

2008 Ph.D., Applied and Interdisciplinary Mathematics, University of Michigan

2001 B.S.E., Mechanical Engineering, Princeton University

#### **POST-GRADUATE TRAINING:**

2008-2010 Postdoctoral Research Associate, Biomedical Engineering; Mentor, Francisco Valero-Cuevas, University of Southern California

#### **ACADEMIC APPOINTMENTS:**

2019-present Associate Professor (with Tenure), Division of Biokinesiology and Physical Therapy, Herman Ostrow School of Dentistry of USC, University of Southern California

2011-2019 Assistant Professor, Division of Biokinesiology and Physical Therapy, Herman Ostrow School of Dentistry of USC, University of Southern California

2010-2011 Research Assistant Professor, Department of Biomedical Engineering, University of Southern California

**COURTESY APPOINTMENTS:**

2011-present Department of Biomedical Engineering  
Viterbi School of Engineering  
University of Southern California, Los Angeles, CA

**AWARDS, HONORS AND FELLOWSHIPS:**

2016 USC Biokinesiology and Physical Therapy *Commendation for Excellence in Teaching.*  
2013 USC Biokinesiology and Physical Therapy *Commendation for Excellence in Teaching.*  
2012 Selected to deliver a Rackham Centennial Alumni Lecture, University of Michigan  
2006 Alice Webber Glover Scholarship, University of Michigan  
2007-2008 NIH F31 Pre-doctoral Training Fellowship  
2002-2005 National Science Foundation VIGRE Fellowship  
2001 Morgan W. McKinzie '93 [best Mech. Eng.] Senior Thesis Prize, Princeton University  
2001 Donald Janssen Dike Award, Princeton University  
2000 John Marshall II Memorial Prize (Honorable Mention), Princeton University

**MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS:**

2011-Present International Pelvic Pain Society  
2004-Present Society for the Neural Control of Movement  
2001-Present Society for Neuroscience

**II. ADMINISTRATIVE AND SERVICE ACTIVITIES**

**UNIVERSITY SERVICE:**

**USC DIVISION OF BIOKINESIOLOGY AND PHYSICAL THERAPY:**

2019-present Research Advancement Committee  
2017-present Faculty Affairs Committee  
2013-present Information Technology Committee  
2011-present PhD Admissions Committee

## **USC PROGRAMS:**

- |              |   |
|--------------|---|
| 2011-present | Affiliated Faculty, Neuroscience Graduate Program   |
| 2011-present | Affiliated Faculty, Program in Biomedical and Biological Science<br>Keck School of Medicine |

## **EDITORIAL ACTIVITIES:**

### **SCIENTIFIC REVIEW FOR JOURNALS:**

- |                       |  |
|-----------------------|--|
| 2019                  | Journal of Urology                             |
| 2019                  | Neuroimage                                     |
| 2019                  | Neurourology and Urodynamics                   |
| 2019                  | Neuroimage: Clinical                           |
| 2018                  | Cerebral Cortex                                |
| 2011-12, 2016, 2019   | Journal of Neurophysiology                     |
| 2016                  | Journal of Neuroscience                        |
| 2019                  | Pain Reports                                   |
| 2015                  | Developmental Medicine & Child Neurology       |
| 2018, 2019            | Scientific Reports                             |
| 2015, 2017, 2018      | PAIN   |
| 2015                  | Arthritis Research & Therapy                   |
| 2014, 2016            | Journal of Pain                                |
| 2012, 2014-2018       | PLoS One                                       |
| 2011-2012, 2014, 2016 | PLoS Computational Biology                     |
| 2011                  | Human Movement Science                         |
| 2011                  | Journal of Motor Behavior                      |
| 2011                  | Journal of Orthopedic Research                 |
| 2013                  | Experimental Brain Research                    |
| 2012                  | IEEE Transactions on Biomedical Engineering    |
| 2012, 2014            | Journal of Biomechanics                        |
| 2014                  | Journal of Neural Engineering                  |
| 2014                  | NeuroReport                                    |
| 2012                  | Medical & Biological Engineering & Computing   |
| 2012                  | J Applied Biomechanics                         |
| 2013, 2015            | Medicine and Science in Sports and Exercise    |
| 2013                  | Biological Cybernetics                         |
| 2016                  | Annals of Clinical and Translational Neurology |

## GRANT REVIEW:

|                  |  |
|------------------|--|
| 2018             | National Institutes of Health (NIH), Center for Scientific Review, Motor Function Speech and Rehabilitation (MFSR) Study Section |
| 2013, 2014, 2015 | US Department of Veterans Affairs (VA)   |
| 2013, 2016       | US National Science Foundation (NSF)   |
| 2012, 2013, 2014 | Southern California Clinical and Translational Science Institute (CTSI)  |

## SERVICE TO PROFESSIONAL ORGANIZATIONS:

|              |  |
|--------------|--|
| 2020-2021    | Secretary of the International Pelvic Pain Society (IPPS)                |
| 2020-Present | Elected Executive Board Member, International Pelvic Pain Society (IPPS) |
| 2015-2018    | Elected Board Member, International Pelvic Pain Society (IPPS)           |

## III. SCHOLARLY ACTIVITY

### PUBLICATIONS:

*Asterisks indicates direct students or post-doctoral mentee; underline indicates senior author.*

### PEER-REVIEWED JOURNAL ARTICLES – INVITED REVIEWS:

- 2019 Clemens JQ, Mullins C, [*Subsequent authors before last author are listed alphabetically*] Ackerman AL, Bavendam T, van Bokhoven A, Ellingson BM, Harte SE, **Kutch JJ**, Lai HH, Martucci KT, Moldwin R, Naliboff BD, Pontari MA, Sutcliffe S, Landis JR. Urologic chronic pelvic pain syndrome: insights from the MAPP Research Network. *Nat Rev Urol.* 2019;16(3):187-200.
- **I wrote neuroimaging section**, and I am one of only two authors acknowledged in contribution section for analyzing data for the article  
*Journal Impact Factor (2018): 9.333*

### PEER-REVIEWED JOURNAL ARTICLES – ORIGINAL RESEARCH:

- 2022 Yani MS\*, Eckel SP, Kirages DJ, Rodriguez LV, Corcos DM, **Kutch JJ**. Impaired ability to relax pelvic floor muscles in men with chronic prostatitis/chronic pelvic pain syndrome. *Physical Therapy & Rehabilitation Journal (PTJ)*. *In Press*.
- 2022 McLain NJ, Yani MS, **Kutch JJ**. Analytic consistency and neural correlates of peak alpha frequency in the study of pain. *Journal of Neuroscience Methods* 2022; 368.
- 2021 Deutsch G, Deshpande H, Lai HH, **Kutch JJ**, Ness TJ. Cerebral Perfusion and Sensory Testing Results Differ in Interstitial Cystitis/Bladder Pain Syndrome Patients with and without Fibromyalgia: A Site-Specific MAPP Network Study. *J Pain Res.* 2021;14:3887-3895.

- 2021 Hegarty AK, Hsu M, Roy JS, Kardouni JR, **Kutch JJ**, Michener LA. Evidence for increased neuromuscular drive following spinal manipulation in individuals with subacromial pain syndrome. *Clin Biomech*. 2021 Dec;90:105485.
- 2021 Macaulay TR, Pa J, **Kutch JJ**, Lane CJ, Duncan D, Yan L, Schroeder ET. 12 weeks of strength training improves fluid cognition in older adults: A nonrandomized pilot trial. *PLoS One*. 2021 Jul 22;16(7):e0255018.
- 2021 Shih Y, Fisher BE, **Kutch JJ**, Powers CM. Corticomotor excitability of gluteus maximus and hip extensor strength: The influence of sex. *Hum Mov Sci*. 2021 Aug;78:102830.
- 2021 Shih HS, Van Dillen LR, **Kutch JJ**, Kulig K. Individuals with recurrent low back pain exhibit further altered frontal plane trunk control in remission than when in pain. *Clin Biomech*. 2021 Jul;87:105391.
- 2020 Mawla I, Schrepf A, Ichesco E, Harte SE, Klumpp DJ, Griffith JW, Strachan E, Yang CC, Lai H, Andriole G, Magnotta VA, Kreder K, Clauw DJ, Harris RE, Clemens JQ, Landis JR, Mullins C, Rodriguez LV, Mayer EA, **Kutch JJ**. Natural bladder filling alters resting brain function at multiple spatial scales: A proof-of-concept MAPP Network Neuroimaging Study. *Scientific Reports*. 2020 Nov 16;10(1):19901. *Journal Impact Factor (2019) = 3.998*
- 2020 Fenske SJ\*, Bierer D, Chelimsky G, Conant L, Ustine C, Yan K, Chelimsky T, **Kutch JJ**. Sensitivity of functional connectivity to periaqueductal gray localization, with implications for identifying disease-related changes in chronic visceral pain: A MAPP Research Network Neuroimaging Study. *Neuroimage: Clinical*, 2020 Sep 20;28:102443. *Journal Impact Factor (2019) = 4.350*
- 2020 Varghese R, **Kutch JJ**, Schweighofer N, Winstein CJ. The probability of choosing both hands depends on an interaction between motor capacity and limb-specific control in chronic stroke. *Experiential Brain Research*, 2020 Nov;238(11):2569-2579. *Journal Impact Factor (2019) = 1.591*
- 2020 Hegarty AK\*, Yani MS\*, Albishi A\*, Michener LA, **Kutch JJ**. Salience network functional connectivity is spatially heterogeneous across sensorimotor cortex in healthy humans. *Neuroimage* 2020 Nov 1;221:117177. *Journal Impact Factor (2019) = 5.902*
- 2020 Clemens JQ, **Kutch JJ**, Mayer EA, Naliboff BD, Rodriguez LV, Klumpp D, Schaeffer AJ, Kreder KJ, Clauw DJ, Harte SE, Schrepf AD, Williams DA, Andriole GL, Lai HH, Buchwald D, Lucia MS, van Bokhoven A, Mackey S, Moldwin RM, Pontari MA, Stephens-Shields AJ, Mullins C, and Landis JR The Multidisciplinary Approach to The Study of Chronic Pelvic Pain (MAPP) Research Network: Design and Implementation of the Symptom Patterns Study (SPS). *Neurourology and Urodynamics*, 2020 Aug;39(6):1803-1814. *Journal Impact Factor (2019) = 2.037*
- 2020 Barradas VR, **Kutch JJ**, Kawase T, Koike Y, Schweighofer N. When 90% of the variance is not enough: residual EMG from muscle synergy extraction influences task performance. *J Neurophysiol*. 2020;123(6):2180-2190. *Journal Impact Factor (2019) = 2.234*
- 2019 Kuo Y-L, **Kutch JJ**, Fisher BE. Relationship between Interhemispheric Inhibition and Dexterous Hand Performance in Musicians and Non-musicians. *Scientific Reports*. 2019;9(1):11574. *Journal Impact Factor (2018) = 4.122*
- 2019 Gupta A, Bhatt RR, Naliboff BD, **Kutch JJ**, Labus JS, Vora PP, Alaverdyan M, Schrepf A, Lutgendorf S, Mayer EA. Impact of early adverse life events and sex on functional brain networks in patients with urological chronic pelvic pain syndrome (UCPPS): A MAPP Research Network study. *PLoS One*. 2019;14(6):e0217610.

*Journal Impact Factor (2018) = 2.776*

- 2019 Yani MS\*, Fenske SJ\*, Rodriguez LV, **Kutch JJ**. Motor cortical neuromodulation of pelvic floor muscle tone: Potential implications for the treatment of urologic conditions. *Neurourology and Urodynamics*. 2019;38(6):1517-23.

*Journal Impact Factor (2018) = 3.263*

- 2018 Woodworth DC, Dagher A, Curatolo A, Sachdev M, Ashe-McNalley C, Naliboff BD, Labus JS, Landis JR, **Kutch JJ**, Mayer EA, Lee RS, Moses MA, Ellingson BM. Changes in brain white matter structure are associated with urine proteins in urologic chronic pelvic pain syndrome (UCPPS): A MAPP Network study. *PLoS ONE*;13(12).

*Journal Impact Factor (2017) = 2.766*

- 2018 Yani MS\*, Wondolowski JH, Eckel SP, Kulig K, Fisher BE, Gordon JE, **Kutch-JJ**. Distributed representation of pelvic floor muscles in human motor cortex. *Scientific Reports*, 8(1): 7213.

*Journal Impact Factor (2017) = 4.122*

- 2017 **Kutch JJ**, IchESCO E, Hampson JP, Labus JS, Farmer MA, Martucci KT, Ness TJ, Deutsch G, Apkarian AV, Mackey SC, Klumpp DJ, Schaeffer AJ, Rodriguez LV, Kreder KJ, Buchwald D, Andriole GL, Lai HH, Mullins C, Kusek JW, Landis JR, Mayer EA, Clemens JQ, Clauw DJ, **Harris RE**. Brain signature and functional impact of centralized pain: a multidisciplinary approach to the study of chronic pelvic pain (MAPP) network study. *PAIN*, 158(10): 1979-91.

● **Editor's choice article (October 2017 Issue)**

*Journal Impact Factor (2016) = 5.445*

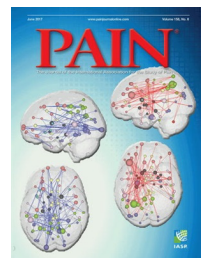
- 2017 Smith JA, Albishi A\*, Babikian S\*, Asavasopon S, Fisher BE, **Kutch JJ**. The motor cortical representation of a muscle is not homogeneous in brain connectivity. *Experimental Brain Research*, 235: 2767–2776.

*Journal Impact Factor (2016) = 1.917*

- 2017 **Kutch JJ**, Labus JS, Harris RE, Martucci KT, Farmer MA, Fenske S\*, Fling C, IchESCO E, Peltier S, Petre B, Guo W, Hou X, Stephens AJ, Mullins C, Clauw DJ, Mackey SC, Apkarian AV, Landis JR, Mayer EA. Resting-state functional connectivity predicts longitudinal pain symptom change in urologic chronic pelvic pain syndrome: a MAPP network study. *PAIN*,158(6):1069-82.

● **Cover article in June 2017 issue**

*Journal Impact Factor (2016) = 5.445*



- 2017 Reyes A, Laine CM, **Kutch JJ**, Valero-Cuevas FJ. Beta Band Corticomuscular Drive Reflects Muscle Coordination Strategies. *Frontiers in Computational Neuroscience*, 11(17).

*Journal Impact Factor (2016) = 1.821*

- 2017 Duff SV, Sargent B, **Kutch JJ**, Berggren J, Leiby BE, Feters L. Using Contingent Reinforcement to Augment Muscle Activation After Perinatal Brachial Plexus Injury: A Pilot Study. *Physical & Occupational Therapy In Pediatrics*, 1-11.

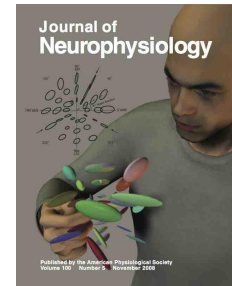
*Journal Impact Factor (2016) = 0.839*

- 2017 Babikian S\*, Kanso E, **Kutch JJ**. Cortical activity predicts good variation in human motor output. *Experimental Brain Research*, 235:1139-1147.

*Journal Impact Factor (2016) = 1.917*

- 2016 Huang L, **Kutch JJ**, Ellingson BM, Martucci KT, Harris RE, Clauw DJ, Mackey S, Mayer EA, Schaeffer AJ, Apkarian AV. Brain white matter changes associated with urological chronic pelvic pain syndrome: multisite neuroimaging from a MAPP case-control study. *PAIN*, 157:2782-91. *Journal Impact Factor (2016) = 5.445*
- 2015 Woodworth D, Mayer E, Leu K, Ashe-McNalley C, Naliboff BD, Labus JS, Tillisch K, **Kutch JJ**, Farmer MA, Apkarian AV, Johnson KA, Mackey SC, Ness TJ, Landis JR, Deutsch G, Harris RE, Clauw DJ, Mullins C, Ellingson BM, Network MR. Unique Microstructural Changes in the Brain Associated with Urological Chronic Pelvic Pain Syndrome (UCPPS) Revealed by Diffusion Tensor MRI, Super-Resolution Track Density Imaging, and Statistical Parameter Mapping: A MAPP Network Neuroimaging Study. *PLoS ONE*, 10(10):e0140250. *Journal Impact Factor (2015) = 3.057*
- 2015 Rana M\*, Yani MS\*, Asavasopon S\*, Fisher BE, **Kutch JJ**. Brain Connectivity Associated with Muscle Synergies in Humans. *The Journal of Neuroscience*, 35(44):14708-16. *Journal Impact Factor (2015) = 5.924*
- 2015 **Kutch JJ**, Yani MS\*, Asavasopon S\*, Kirages DJ, Rana M\*, Cosand L\*, Labus JS, Kilpatrick LA, Ashe-McNalley C, Farmer MA, Johnson KA, Ness TJ, Deutsch G, Harris RE, Apkarian AV, Clauw DJ, Mackey SC, Mullins C, Mayer EA. Altered resting state neuromotor connectivity in men with chronic prostatitis/chronic pelvic pain syndrome: A MAPP Research Network Neuroimaging Study. *NeuroImage: Clinical*, 8(0):493-502. *Journal Impact Factor (2015) = 3.857*
- 2015 Roll SC, Rana M\*, Sigward SM, Yani MS\*, Kirages DJ, **Kutch JJ**. Reliability of Superficial Male Pelvic Floor Structural Measurements Using Linear-Array Transperineal Sonography. *Ultrasound in Medicine & Biology*, 41:610-7. *Journal Impact Factor (2015) = 2.298*
- 2014 Asavasopon S\*, Rana M\*, Kirages DJ, Yani MS\*, Fisher BE, Hwang DH, Lohman EB, Berk LS, **Kutch JJ**. Cortical activation associated with muscle synergies of the human male pelvic floor. *The Journal of Neuroscience*, 34(41):13811-13818. *Journal Impact Factor (2014) = 6.344*
- 2014 Kilpatrick LA, **Kutch JJ**, Tillisch K, Naliboff BD, Labus JS, Jiang Z, Farmer MA, Apkarian AV, Mackey SC, Martucci KT, Clauw DJ, Harris RE, Deutsch G, Ness TJ, Yang CC, Maravilla K, Mullins C, Mayer EA. Alterations in resting state oscillations and connectivity in sensory and motor networks in women with interstitial cystitis/painful bladder syndrome. *The Journal of Urology*, 192(3):947-955. *Journal Impact Factor (2014) = 4.360*
- 2013 Dayanidhi S, **Kutch JJ**, Valero-Cuevas FJ. Decrease in muscle contraction time complements neural maturation in the development of dynamic manipulation. *The Journal of Neuroscience*, 33(38):15050-15055. *Journal Impact Factor (2013) = 6.747*
- 2013 Roll SC, **Kutch JJ**. Transperineal sonography evaluation of muscles and vascularity in the male pelvic floor. *Journal of Diagnostic Medical Sonography*, 29:3-10. *No ISI journal impact factor*
- **2nd place winner of the 2013 Kenneth R. Gottesfeld Award**, recognizing sonographer authors for the publication of outstanding research or review articles in the Journal of Diagnostic Medical Sonography

- 2012 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. A novel synthesis of computational approaches enables optimization of grasp quality of tendon-driven hands. *IEEE Transactions on Robotics*, 28:958–966. *Journal Impact Factor (2012) = 2.571*
- 2012 **Kutch JJ**, Valero-Cuevas FJ. Challenges and new approaches to proving the existence of muscle synergies of neural origin. *PLoS Computational Biology*, 8(5):e1002434. *Journal Impact Factor (2012) = 4.867*
- 2011 **Kutch JJ**, Valero-Cuevas FJ. Muscle redundancy does not imply robustness to muscle dysfunction. *Journal of Biomechanics*, 44:1264–1270. *Journal Impact Factor (2011) = 2.716*
- 2010 **Kutch JJ**, Kuo AD, Rymer WZ. Extraction of individual muscle mechanical action from endpoint force. *Journal of Neurophysiology*, 103:3535–3546. *Journal Impact Factor (2010) = 3.114*
- 2009 Valero-Cuevas FJ, Hoffmann H, Kurse MU, **Kutch JJ**, Theodorou EA. Computational models for neuromuscular function. *IEEE Reviews in Biomedical Engineering*, 2:110–135. *No ISI journal impact factor*
- 2008 **Kutch JJ**, Kuo AD, Bloch AM, Rymer WZ. Endpoint force fluctuations reveal flexible rather than synergistic patterns of muscle cooperation. *Journal of Neurophysiology*, 100(5):2455-71. *Journal Impact Factor (2008) = 3.648*
- **Cover article in November 2008 issue**
  - Article of **outstanding** interest in review by Tresch MC and Jarc A, "The case for and against muscle synergies". *Current opinion in Neurobiology* 2009, 19:1-7
- 2007 **Kutch JJ**, Suresh NL, Bloch AM, Rymer WZ. Analysis of the effects of firing rate and synchronization on spike-triggered averaging of multidirectional motor unit torque. *Journal of Computational Neuroscience*, 22:347–361. *Journal Impact Factor (2007) = 1.928*
- 2001 **Kutch JJ**, Buchanan TS. Human elbow joint torque is linearly encoded in electromyographic signals from multiple muscles. *Neuroscience Letters*, 311:97–100. *Journal Impact Factor (2001) = 2.021*



#### INVITED COMMENTARY IN PEER-REVIEWED JOURNALS:

- 2016 **Kutch JJ**, Tu FF. Altered brain connectivity in dysmenorrhea: pain modulation and the motor cortex *PAIN*. 157(1):5-6.

#### BOOK CHAPTERS:

- 2014 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. *Optimizing the topology of tendon-driven fingers: Rationale, predictions and implementation*, pages 247–266. Springer.

#### DISSERTATION AND THESIS:



- 2008 “Signal in Human Motor Unsteadiness: Determining the Action and Activity of Muscles”. Applied and Interdisciplinary Mathematics, University of Michigan.
- 2001 “State observability in neuromuscular control systems: optimal subspace representations and EMG reconstructions”, Mechanical Engineering, Princeton University. **Awarded best thesis in Mechanical Engineering.**

### **NEWS RELEASES:**

- 2021 “Chronic Prostatitis/Pelvic Pain Syndrome Series (Part 1 of 3): The Research/Science Perspective with Jason Kutch, PhD” The Prostate Health Podcast with Dr. Garrett Pohlman. Available as of 03/11/2021: <https://www.prostatehealthpodcast.com/52>
- 2020 “Grant supports research on chronic, debilitating condition in women”. USC News. Available as of 10/29/2020: <https://pt.usc.edu/2020/08/20/a-different-approach/>
- 2020 “Scientists receive grant to research novel approach for treating painful pelvic disorder”. HSC News. Available as of 10/29/2020: <https://hscnews.usc.edu/scientists-receive-grant-to-research-novel-approach-for-treating-painful-pelvic-disorder>
- 2019 “Pelvic pain researchers receive federal grant to continue groundbreaking study”, USC News. Available as of 9/20/2019: <https://news.usc.edu/160284/pelvic-pain-research-federal-grant-ucpps/>
- 2017 “Chronic pelvic pain affects millions, but not much is known about it”, USC News. Available as of 5/28/2018: <https://news.usc.edu/116282/chronic-pelvic-pain-affects-millions-but-not-much-is-known-about-it/>
- 2015 “Training the Brain to Reprogram Muscles: Dr. Jason Kutch speaks on CPP”, Pelvic Messenger, Available as of 5/28/2018: <http://www.blogtalkradio.com/pelvicmessenger/2015/02/23/training-the-brain-to-reprogram-muscles-dr-jason-kutch-speaks-on-cpp>
- 2014 “How pelvic muscles help delay urination”, Digital Journal. Available as of 5/28/2018: <http://www.digitaljournal.com/science/how-pelvic-muscles-help-delay-urination/article/409448>
- 2014 “Neuro-Insights into Holding It”, The-Scientist. Available as of 5/28/2018: <http://www.the-scientist.com/?articles.view/articleNo/41248/title/Neuro-Insights-into-Holding-It/>
- 2014 “The Neuroscience of Holding It”, USC News. Available as of 5/28/2018: <https://pressroom.usc.edu/the-neuroscience-of-holding-it/>

### **MAJOR PUBLIC PRESENTATIONS:**

#### **INVITED, KEYNOTE**

- 2020 “Motor Cortical Treatment Targets for Chronic Pelvic Pain: Big Data, Small Data, and Clinical Trials” State of the Art Keynote Lecture. *The Society for Pelvic Research, Fifth Annual Meeting*. December 11-13, 2020.

#### **INVITED, HERMAN OSTROW SCHOOL OF DENTISTRY OF USC**

2016 “A moving story about brains: blissful function and painful dysfunction in brain connectivity of movement control” *Herman Ostrow School of Dentistry of USC Research Day Keynote Lecture*

**INVITED, INTERNATIONAL:**

2022 “Transcranial Magnetic Stimulation of Brain Centers Controlling Pelvic Floor Muscles for the Treatment of Chronic Pelvic Pain”, *2022 Winter Meeting of the Society of Urodynamics, Female Pelvic Medicine, and Urogenital Reconstruction (SUFU), San Diego, CA, February 22-26, 2022.*

2021 “Motor cortical treatment targets for chronic pelvic pain: Big data, small data, and clinical trials” *4<sup>th</sup> International Brain Stimulation Conference, Charleston, South Carolina (originally Kyoto Japan, moved due to COVID-19), December 4-7, 2021.*

2020 “Pelvic Pain with Chronic Overlapping Pain Conditions: Clinical Impact, Brain Changes and a Model for Development” *2020 International Pelvic Pain Society Meeting, Virtual, October 17, 2020.*

2019 “Finding the central in centralized pain: Connectivity between the sensorimotor and pain networks in the human brain” *World Congress on Low Back and Pelvic Girdle Pain, Antwerp, Belgium, October, 2019.*

2018 “Functional/Structural MRI to identify stratifying factors in chronic pelvic pain”, *17<sup>th</sup> World Congress on Pain, International Association for the Study of Pain (IASP), Boston, MA, September 2018.*

2018 “Multidisciplinary Approach to the study of chronic Pelvic Pain (MAPP) - Functional MRI for chronic pelvic pain”, *International Continence Society, Philadelphia PA, August 2018.*

2017 “Decoding the Past and Future of Symptoms from Brain Imaging in Individuals with Urologic Chronic Pelvic Pain Syndrome”, *2017 International Pelvic Pain Society Meeting, Washington DC, October 2017.*

2014 “Proving the existence of muscle synergies of neural origin”, *International Workshop on Muscle Synergies, Ospedale San Camillo, Venice, Italy, April 2014.*

2014 “Altered brain motor control networks in men with chronic pelvic pain: A MAPP Network Neuroimaging Study”, *2014 International Pelvic Pain Society Meeting, Palmer House Hilton, Chicago, Illinois, October 2014.*

2012 “Simultaneous pelvic floor physical therapy and functional brain imaging: applications to mind-body interactions in chronic pain”, *2012 International Pelvic Pain Society Meeting, Palmer House Hilton, Chicago, Illinois, October 18-20, 2012.*

2009 “Noise as a window to neuromuscular function: A tutorial”, *Workshop on Noise, Delays and Balance Control, Banff International Research Station, November 2009.*

2008 “Flexible motor action but simple neural architecture: is it possible?”, *Simon Fraser University Kinesiology Seminar, June 2008.*

2006 “Using spike-triggered averaging to investigate differential force generation and connectivity among motor units”, *Motoneurons and their Firing Properties, Panum Institute, Copenhagen, Denmark, July 2006.*

**INVITED, NATIONAL:**

- 2021 “Motor Cortical Treatment Targets for Chronic Pelvic Pain: Big Data, Small Data and Clinical Trials”, Center for Neuroregeneration Lecture Series, Houston Methodist, March 16, 2021.
- 2018 “Motor cortex and the real reason for chronic pain”, *Ohio Musculoskeletal and Neurological Institute Seminar Series*, Ohio University, May 17, 2018.
- 2017 “Neuroimaging of the Motor System in Chronic Pelvic Pain”, *University of Florida Applied Physiology and Kinesiology*, October 5, 2017.
- 2017 “Neuroimaging of the motor system in chronic pelvic pain”, *Northwestern University Physical Therapy Seminar*, March 2017.
- 2016 “Summary of Neuroimaging Findings from the MAPP Research Network” *Annual Meeting of the Society for Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (SUFU)*, New Orleans, February 2016.
- 2016 “Motor cortical changes in chronic pain: Is the core of the problem in the core of the brain?”, *2016 Combined Sections Meeting of the American Physical Therapy Association*, Anaheim CA, January, 2016.
- 2014 “The muscle synergies you didn’t know you have: cortical coordination of pelvic floor and non-pelvic floor muscles”, *Sensory Motor Performance Program Seminar*, Rehabilitation Institute of Chicago, Chicago, Illinois, October 2014.
- 2013 “Men’s Health Issues: An Introduction From Front to Rear”, *2013 Combined Sections Meeting of the American Physical Therapy Association*, San Diego, January, 2013.
- 2012 “Central and peripheral dynamics in chronic prostatitis/chronic pelvic pain syndrome”, *Northwestern University Physiology Seminar*, October 23, 2012.
- 2012 “Is math the cause of or cure for chronic pain?: New approaches to the perplexing problem of pain”, **Invited lecture as distinguished alumnus** for series celebrating the Centennial of the Rackham Graduate School, University of Michigan, Ann Arbor, October 2, 2012.
- 2012 “Neuromechanics and Spinal Cord”, part of the *2012 Computational Sensorimotor Neuroscience Summer School*, Northwestern University, August 2012.
- 2008 “Force variability as an indicator of neural control dimensionality”, *Biomechanics: Muscle, Limb, and Brain*, Mathematical Biosciences Institute, The Ohio State University, January 14-18, 2008.

#### **INVITED, STATE:**

- 2015 “Unraveling a Brain Interface between Skeletal Muscle Function and the Viscera in Humans”, UCLA Center for the Neurobiology of Stress and Resilience Retreat, 2015.
- 2015 “Mapping and Therapeutically Targeting the Brain Network of Pelvic Floor Muscle Control”, UCLA Bioengineering Seminar, April 30, 2015.
- 2012 “Simultaneous pelvic floor physical therapy and brain imaging in Chronic Pelvic Pain”, part of *19th Joint Symposium on Neural Computation*, University of California, Riverside, June 2, 2012.

- 2012 “Simultaneous pelvic floor physical therapy and brain imaging in Chronic Pelvic Pain”, *UCLA Center for the Neurobiology of Stress Seminar*, May, 2012.
- 2011 “Is math the cause of or cure for chronic pain?: New approaches to the perplexing problem of pain”, *Sixth Annual Symposium for the UCLA Biotechnology Training in Biomedical Sciences and Engineering Program*, June 2011.
- 2009 “Muscle Synergies Without a Brain or Spinal Cord”, *UCLA Bioengineering Seminar*, June 2009.
- 2008 “Non-invasive muscle activity measurement using physiological tremor in the human finger”, *UCSD Orthopedics Seminar*, October 2008.

**INVITED, LOCAL:**

- 2021 “Unravelling fronto-parietal brain networks in chronic pain” *UCLA Computational Medicine Research Frontiers in Biomathematics Seminar Series*, November 4, 2021.
- 2020 “Motor cortical treatment targets for chronic pelvic pain: Big Data, Small Data, and Clinical Trials” *UCLA Neuromodulation Seminar*, October 27, 2020.
- 2019 “Central and Peripheral Mechanisms of Pain: The Importance of Where it Hurts” *Current Concepts in Spine*, USC Symposium, November 2019.
- 2012 “Simultaneous pelvic floor physical therapy and functional brain imaging: applications to mind- body interactions in chronic pain”, *Biokinesiology and Physical Therapy Neuro-Rehabilitation Seminar*, March, 2012.
- 2011 “Applying mathematical physiology to unravel compromised neuromuscular control in chronic pain”, *Engineering, Neuroscience, and Health Seminar Series*, University of Southern California, August 29, 2011.
- 2010 “May the best muscles win: new insights into how the nervous system controls multiple muscles”, *Biomedical Engineering Seminar*, University of Southern California, March 2010.
- 2009 “Muscle redundancy revisited: if muscles are redundant, which one can you spare?”, *USC Biokinesiology Division Seminar*, October 2009.
- 2007 “An experimental approach to muscle redundancy”, *University of Michigan Mathematical Biology Seminar*, October 2007.
- 2007 “Non-uniform patterns of multidirectional isometric force noise”, *Neural Signal Processing Seminar*, Rehabilitation Institute of Chicago, February 2007.
- 2003 “Eigenfaces: decomposing facial image databases into orthogonal components”, *University of Michigan Applied Mathematics Seminar*, January 2003.
- 2002 “Hodgkin-Huxley: from neuron to equation”, *University of Michigan Mathematical Biology Seminar*, November 2002.

2002 “Does the CNS encode torque to control movement?”, *Mid-Atlantic Motor Control Meeting*, University of Delaware, April 2002.

### **REFEREED, INTERNATIONAL:**

- 2020 “Chronic pelvic pain syndromes: Recent developments in the pathophysiology, assessment and management of this poorly understood and multidimensional problem”. International Federation of Orthopaedic Manipulative Physical Therapists (IFOMPT). Melbourne, Australia, October 2020.  
*Conference Cancelled due to COVID-19*
- 2018 “Neuroimaging-derived biomarkers of chronic pelvic pain in the motor system” International Society of Electrophysiology and Kinesiology (ISEK), Dublin Ireland, June 30-July 2, 2018.
- 2017 “Neuroimaging of the motor system in chronic pelvic pain” part of the symposium I organized titled “The Motor System in Acute and Chronic Pain”, 27<sup>th</sup> Annual Meeting of the Society for the Neural Control of Movement (NCM), Dublin, Ireland, May 2017.
- 2016 “Function and dysfunction in brain connectivity coordinating muscle synergies in humans” International Society of Electrophysiology and Kinesiology (ISEK), Chicago, July 2016.
- 2015 “Distinct motor cortical regions associated with human pelvic floor muscle synergies”, 25<sup>th</sup> Annual Meeting of the Society for the Neural Control of Movement (NCM), Charleston, SC, April 2015.
- 2011 “EMG is not recruitment”, part of symposium entitled “Myths and Monsters in Motor Control”, *21st annual meeting of the Society for the Neural Control of Movement*, San Juan, Puerto Rico, May 2011.
- 2010 “Computational Hypothesis Testing for Neuromuscular Systems”, *32nd Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Buenos Aires, Argentina, August 31-September 4 2010.

### **REFEREED, NATIONAL:**

- 2013 “Cortical Control of Pelvic Musculature: Stimulation and Functional Imaging”, *The Annual Meeting for the American Society of Biomechanics*, August 2013, Omaha, Nebraska.
- 2011 “Biomechanics to Brain: Unraveling the complex neural connectivity of multi-muscle control”, *The Annual Meeting for the American Society of Biomechanics*, August 2011, Long Beach, California.
- 2010 “Biomechanical and experimental confounds to the detection of neurally-generated muscle synergies”, *The Annual Meeting for the American Society of Biomechanics*, August 18-21, 2010, Providence, Rhode Island.
- 2009 “Simple finger movements require complex coordination of excursions and forces across all muscles”, *The Annual Meeting for the American Society of Biomechanics*, August 26-29, 2009, State College, Pennsylvania.

### **PUBLISHED ABSTRACTS:**

- 2023 Heindel MD, **Kutch JJ**, Michener LA. Resting-State Brain Activity in Rotator Cuff Tendinopathy Revealed Trait-like Differences from Pain-Free Controls. Combined Sections Meeting-APTA; San Diego, CA; February, 2023.
- 2021 Mawla I, Schrepf A, Helmuth ME, Ichesco E, Lai HH, Yang C, Smith AR, Andreev VP, **Kutch JJ**, Harte SE, and Harris RE. Latent class trajectory models of urge during natural bladder filling identifies subtypes of overactive bladder syndrome: a Symptoms of Lower Urinary Tract Dysfunction Research Network (LURN) Study. *American Urological Association Annual Meeting*, 2021.
- 2020 Mawla I, Schrepf A, Ichesco E, **Kutch JJ**, Lai HH, Helmuth ME, Andreev VP, Harris RE, Kirkali Z, Harte SE, and LURN Study Group, 2020. MP54-10 Subtypes of sensory sensitivity in overactive bladder syndrome: results of neuroimaging and sensory testing from the symptoms of lower urinary tract dysfunction research network (LURN). *The Journal of Urology*, 203(Supplement 4), pp.e795-e795.
- 2020 Locke K., Lai HH, Pontari MA, Clemens JQ, Kreder KJ, Krieger JN, Andriole GL, Mayer EA, **Kutch JJ**, Rodriguez LV, and Naliboff BD, 2020. MP07-20 Discovery, validation and novel visualization of subgroups in urologic chronic pelvic pain syndrome (UCPPS): consensus clustering findings from the MAPP research network. *The Journal of Urology*, 203(Supplement 4), pp.e104-e104.
- 2020 Mawla I, Schrepf A, Ichesco E, Harte SE, Harris RE, **Kutch JJ**. Naturalistic Bladder Filling as a Tool to Examine Brain Circuits of Urinary Urgency in Healthy Individuals: A MAPP Research Network Study. Poster presented at the 2020 Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (SUFU) conference, Scottsdale, AZ.
- 2019 Hegarty AK, Yani MS, Albishi A, Michener LA, **Kutch JJ** (2019). “Salience network functional connectivity is spatially heterogeneous across sensorimotor cortex in healthy humans.” *Society of Neuroscience (SfN) Annual Meeting*. Chicago, IL. Oct 19-23, 2019.
- 2019 Fenske S, **Kutch JJ** (2019). Resting state functional connectivity can predict progression of chronic pelvic pain. Poster presented at: The Organization for Human Brain Mapping Annual Meeting; Rome, Italy, June 2019.
- 2019 Locke K, Lai HH, Pontari MA, Clemens JQ, Kreder KJ, Krieger JN, Andriole GL, Mayer EA, **Kutch JJ**, Rodriguez LV, Moldwin RM, Farrar JT, Mullins C, Landis JR, Pain Profile Discovery in Urologic Chronic Pelvic Pain Syndrome (UCPPS): Consensus Clustering Findings from the MAPP Research Network, *American Urological Association Annual Meeting*, Chicago, IL, 2019.
- 2018 Albishi A, Fisher B, **Kutch JJ**, “Neuroanatomical and Functional Substrates Associated with Single Muscle Representation”, *Society of Neuroscience (SfN) Annual Meeting*, San Diego, CA, 2018.
- 2018 Garbin AJ, Hooyman AM, **Kutch JJ**, Fisher BE, “Combining non-invasive brain technologies to detect and stimulate brain activity”, *Society for Neuroscience (SfN) Annual Meeting*, San Diego, CA, 2018
- 2018 Fenske, S, **Kutch JJ** (2018). “Predicting chronic pelvic pain symptom progression based on resting state functional connectivity”. *Society for Neuroscience (SfN) Annual Meeting*. San Diego, CA 2018.
- 2017 Yani MS\*, Fenske S\*, **Kutch JJ** “Contribution of human motor cortex to Interstitial Cystitis/Painful Bladder Syndrome: a pilot neuromodulation study guided by motor cortical control of pelvic floor muscles”, *International Pelvic Pain Society*, Washington DC, October 12-14, 2017.
- 2016 Yani MS\*, Gordon J, Eckel SP, Kirages DJ, Asavasopon S, **Kutch JJ**, “Cortical activation associated with automatic control of pelvic floor muscles in women”, *Society for Neuroscience (SfN) Annual Meeting*, San Diego, CA, November 2016

- 2016 Albishi A\*, Smith J, Fisher B, **Kutch JJ** “Adjacent motor cortical areas have distinct brain functional connectivity”, *Society for Neuroscience (SfN) Annual Meeting*, San Diego, CA, November 2016.
- 2016 **Kutch JJ**, et al. “Functional Impact and Neurologic Signature of Centralized Pain among Persons with Urologic Chronic Pelvic Pain Syndromes (UCPPS)”. *16th World Congress on the Study of Pain, International Association for the Study of Pain (IASP)*, Yokohama, Japan, September 26-30 2016.
- 2016 Babikian S\*, Kanso E, **Kutch JJ**. “Neural signals associated with task-irrelevant movement variability in humans.” *26th Annual Meeting of the Society for the Neural Control of Movement*, Jamaica, April 24-29, 2016.
- 2015 Rana M\*, Yani MS\*, Asavasopon S\*, Fisher BE, **Kutch JJ** “Brain connectivity associated with muscle synergies in humans”, *Society for Neuroscience (SfN) Annual Meeting*, Chicago, IL, October 2015.
- 2015 Duff SV, Sargent B, **Kutch JJ**, Berggren J, Fetters L “Self-Generated Feedback to Increase Muscle Activation in Infancy”. *Combined Sections Meeting (CSM) of the American Physical Therapy Association (APTA)*, Indianapolis, IN, February 2015.
- 2015 Duff SV, Sargent B, **Kutch JJ**, Berggren J, Fetters L “Self-Generated Feedback to Increase Muscle Activation in Children” *American Academy for Cerebral Palsy and Developmental Medicine*, Austin, TX, October 2015.
- 2014 Rana M\*, Asavasopon S\*, Kirages DJ, Yani MS\*, Fisher BE, Lohman EB, Berk LS, **Kutch JJ** “Cortically- facilitated muscle synergies of the human pelvic floor”, *44th Annual Meeting of the Society for Neuroscience*, November 17, 2014.
- 2014 Asavasopon S\*, Rana M\*, Kirages DJ, Yani MS\*, Lohman EB, Berk LS, **Kutch JJ** “Brain activation associated with decoupling muscle synergies of the human pelvic floor”, *44th Annual Meeting of the Society for Neuroscience*, November 17, 2014.
- 2013 Babikian S, **Kutch JJ**, Kanso E, Valero-Cuevas FJ. “Feasibility of limb postures and slow motions throughout the workspace with muscles as elastic actuators.” *Proceedings of the 6th International IEEE EMBS Conference on Neural Engineering*, San Diego, CA, November 6-8, 2013.
- 2013 Yani MS\*, Cosand L\*, Rana M\*, Kirages D, **Kutch JJ** “The neural representation of the pelvic region and its implications for localizing the source of chronic pelvic pain”, *23rd Annual Meeting of the Society for the Neural Control of Movement*, San Juan, Puerto Rico, April 2013.
- 2011 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. “A Comprehensive Computational Framework to Evaluate Grasp Quality of Tendon-Driven Hands with Arbitrary Topology”. *Proceedings of the 21st Annual Meeting of the Society for the Neural Control of Movement*, San Juan, Puerto Rico, 2011.
- 2011 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. Quantitative Comparison of Grasp Qualities of Two Tendon-driven Hands Using a Novel Methodology. *Proceedings of the 15th Annual Fred S. Grodins Graduate Research Symposium*. Los Angeles, CA, 2011.
- 2011 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. Quantitative prediction of grasp impairment following peripheral neuropathies of the hand. *Proceedings of the 35th Annual Meeting of the American Society of Biomechanics*, Long Beach, CA. August 13th, 2011.

- 2011 Inouye JM, **Kutch JJ**, Valero-Cuevas FJ. A novel methodology to compare grasp quality: application to two dominant tendon-driven designs. *Proceedings of the 35th Annual Meeting of the American Society of Biomechanics*, Long Beach, CA. August 13th, 2011.
- 2010 **Kutch JJ**, Kurse MU, Valero-Cuevas FJ, “Muscle redundancy does not imply robustness to muscle dysfunction”, *40th Annual Meeting of the Society for Neuroscience*, San Diego CA, November 2010.
- 2010 **Kutch JJ**, Valero-Cuevas FJ, “Feasibility before optimality: What complete solution sets tell us about muscle redundancy and synergies”, *Advances in Computational Motor Control (Society for Neuroscience satellite meeting)*, San Diego, CA, November 12, 2010.
- 2010 **Kutch JJ**, Valero-Cuevas FJ, “Obtaining complete solution sets for neuromuscular models”, *ASME 2010 Summer Bioengineering Conference*, Naples, FL, June 2010.
- 2009 **Kutch JJ**, Kurse MU, Hoffmann H, Kuo AD, Valero-Cuevas FJ, “Muscle synergies may be artifacts of biomechanics rather than neural constraints, and are not necessary to simplify control”, *39th Annual Meeting of the Society for Neuroscience*, Chicago IL, October 2009.
- 2009 **Kutch JJ**, Kuo AD, Rymer WZ, “Non-invasively revealing the mechanical action of human muscle”, *2009 Workshop on Multi-Scale Muscle Mechanics*, Woods Hole, MA, September 18-21, 2009.
- 2009 Kurse MU, **Kutch JJ**, Hoffmann H, Fassola I., Lipson H., Valero-Cuevas FJ, “A strain-energy approach to simulating slow finger movements and changes due to loss of musculature”, *Annual Meeting for the American Society of Biomechanics*, State College, Pennsylvania, August 26-29, 2009.
- 2009 Hoffmann H, **Kutch JJ**, Kurse MU, Valero-Cuevas FJ, “Control of muscle strain energy as a robust means to produce slow and accurate finger movements: Proof of concept via hardware and cadaver implementation” *19th Annual Meeting of the Society for the Neural Control of Movement*, Waikoloa Beach, Hawaii, April 2009.
- 2009 **Kutch JJ**, Valero-Cuevas FJ, “All muscles are redundant, but some are less redundant than others”, *19th Annual Meeting of the Society for the Neural Control of Movement*, Waikoloa Beach, Hawaii, April 2009.
- 2007 **Kutch JJ**, Chardon MK, Bloch AM, Rymer WZ, (2007) “Non-uniform patterns of signal-dependent noise during isometric force production at the human metacarpophalangeal joint”, *17th Annual Meeting of the Society for the Neural Control of Movement*, Seville, Spain, March 2007.
- 2006 **Kutch JJ**, Suresh NL, Kuo AD, Bloch AM, Rymer WZ, “Analysis of firing rate and synchronization on spike-triggered averaging of multidimensional motor unit output”, *45th Conference on Decision and Control*, December 2006, San Diego, CA.
- 2006 **Kutch JJ**, Suresh NL, Kuo AD, Bloch AM, Rymer WZ, “Effects of discharge synchrony on estimates of motor unit twitch force direction in the first dorsal interosseous muscle”, *36th Annual Meeting of the Society for Neuroscience*, Atlanta GA, October 2006.
- 2005 **Kutch JJ**, Kuo AD, Bloch AM, “Modeling optimal neural excitation of muscle” *35th Annual Meeting of the Society for Neuroscience*, Washington DC, November 2005.
- 2004 **Kutch JJ**, Bloch AM, “Muscular synergies and limb control: toward a minimum synergy hypothesis”, *14th Annual Meeting of the Society for the Neural Control of Movement*, Sitges, Spain, March 28 - April 3, 2004.



- 2002 **Kutch JJ, Buchanan TS**, “Self-organizing maps and the representation of EMG signals in terms of muscular synergies”, *Fourth World Congress of Biomechanics*, August 2002, Calgary, Alberta, Canada.
- 2001 **Kutch JJ, Buchanan TS**, “Individual muscle EMG reconstruction from joint torque”, *31st Annual Meeting of the Society for Neuroscience*, San Diego, November 2001.

## **GRANTS AND/OR CONTRACTS AWARDED:**

### **EXTERNAL GRANTS (FEDERAL/CORPORATE/FOUNDATION FUNDING):**

#### **Principal Investigator:**

- 08/2020-04/2025 **National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK)**  
*Award:* R01 DK121724  
*Title:* Motor cortical neuromodulation in women with Interstitial Cystitis/Bladder Pain Syndrome: reducing pain by improving brain and muscle activity  
*Roles:* Jason Kutch, corresponding PI; Larissa Rodriguez, multiple-PI  
*Funding:* Total Direct Costs: \$1,100,000 (Total Costs: \$1,815,000)  
*Overall Aims:* In this project, we will use a randomized controlled trial to test the hypothesis that repetitive transcranial magnetic stimulation (rTMS) directed at a cortical site that controls pelvic floor muscles can reduce pain, and improve brain and muscle activity in women with IC/BPS.
- 08/2019-06/2022 **National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK)**  
*Award:* U01 DK082370  
*Title:* Multidisciplinary Approach to the Study of Chronic Pelvic Pain (MAPP) Research Network Discovery Site  
*Role:* PI (multiple-PI with Emeran Mayer and Larissa Rodriguez)  
*Percentage of Effort:* 25%  
*Funding:* Total Direct Costs: \$515,040 (Total Costs: \$758,927)  
*Overall Aims:* In this application the MAPP Research Network investigators propose a 3-year extension of MAPP Phase II. This will provide an additional 12 months of follow-up for the MAPP Symptom Patterns Study (SPS). It will also provide time for the MAPP investigators to analyze the large amount of MAPP Phase II data that has been collected.
- 02/2017-01/2021 **National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK)**  
*Award:* R01 DK110669  
*Title:* Sensorimotor impairments in men with Chronic Prostatitis/Chronic Pelvic Pain Syndrome: relationship of resting state brain activity to pelvic floor muscle activation  
*Role:* PI  
*Percentage of Effort:* 20%  
*Funding:* Total Direct Costs: \$863,900 (Total Costs: \$1,345,590)  
*Overall Aims:* In this project, we will test the hypothesis that men with chronic pelvic pain have changes in resting brain function associated with changes in muscle control underlying the dysfunction in this disorder.
- 09/2018-09/2020 **The Charles D. and Mary Bauer Foundation**  
*Award:* Foundation Annual Award Funding  
*Title:* Optimization of Spinal Manual Therapy for Shoulder Pain

*Role:* PI, Michener (Corresponding PI)

*Percent of Effort:* 5% effort (no salary)

*Funding:* Total Costs: \$47,979

*Overall Aims:* Characterize the central nervous system mechanisms using brain imaging and identify predictors of a positive response to spinal manual therapy in patients with rotator cuff disease. The findings will optimize the delivery and treatment response to spinal manual therapy.

07/2016-06/2018

**Interstitial Cystitis Association**

*Title:* “Cortical neuromodulation to reduce symptoms of Interstitial Cystitis/Painful Bladder Syndrome”

*Role:* PI

*Funding:* Total Direct Costs: \$50,000

*Overall Aims:* The goal of this pilot study is to determine if repetitive transcranial magnetic stimulation (rTMS) directed at motor cortical regions that control pelvic floor muscles can reduce symptoms and normalize brain function in women with Interstitial Cystitis/Painful Bladder Syndrome

**Co-Investigator:**

05/2020 – 06/2025

**National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK)**

*Award:* U54 DK064539

*Title:* Sex related differences in Brain Gut Microbiome Interactions in Irritable Bowel Syndrome

*Role:* Jason Kutch (co-Investigator). Mayer/Chang (MPI)

*Year 1 Funding:* \$1,584,406 (Total Cost), USC Sub-award (\$76,184 Total Cost, \$46,172 Direct Cost, \$30,012 F&A)

*Overall Aims:* This proposal aims to gain a better understanding of the role of the gut microbiome and female sex hormones in the modulation of brain gut microbiome interactions in two of the most common disorders of the gastrointestinal tract, irritable bowel syndrome and chronic functional constipation.

07/2014-06/2019

**National Institute of Diabetes and Digestive and Kidney Diseases (NIH/NIDDK)**

*Award:* U01 DK082370

*Title:* “MAPP Research Network Second Phase”

*Role:* Co-Investigator (Principal Investigator of USC sub-award), Mayer/Rodriguez (PI)

*Percentage of effort:* 25%

*Funding:* (USC sub-award only) Total Direct Costs \$359,475 (Total Costs: \$592,673)

*Overall Aims:* The goal of the MAPP Research Network is to provide new insights into underlying etiology, natural history, and risk factors of Urologic Chronic Pelvic Pain Syndrome (UCPPS) in order to provide a translational foundation to facilitate future clinical intervention efforts and improve clinical management of the syndromes.

01/2014-12/2014

**American Physical Therapy Association**

*Title:* “Augmenting muscle activation and function following perinatal brachial plexus injury”

*Role:* Co-Investigator, Duff (PI)

*Percentage of effort:* 5%

*Funding:* Total Costs \$24,456

*Overall Aims:* The intervention we propose aims to augment diminished muscle activation and function after brachial plexus injury through self-generated, visual-auditory feedback triggered via biceps contraction.

## INTERNAL GRANTS (UNIVERSITY FUNDING)

### Principal Investigator:

- 08/2015-07/2016     **USC Division of Biokinesiology and Physical Therapy**  
*Award:* Faculty Seed Grant  
*Title:* “Brain connectivity associated with lower limb coordination deficits”  
*Role:* PI  
*Funding:* Total Direct Costs: \$15,000  
*Overall Aims:* The goal of this pilot study is to use functional magnetic resonance imaging (fMRI) to study the association between brain functional connectivity and lower limb coordination deficits related to knee pain.
- 08/2013-08/2014     **USC Division of Biokinesiology and Physical Therapy**  
*Award:* Faculty Seed Grant  
*Title:* “Identifying cortical mechanisms and new potential treatments of Urologic Chronic Pelvic Pain Syndrome”  
*Role:* PI  
*Funding:* Total Direct Costs: \$8,000  
*Overall Aims:* To use transcranial magnetic stimulation investigate cortical control of the pelvic musculature in healthy controls and patients with Urological Chronic Pelvic Pain Syndrome.
- 07/2012-06/2013     **USC CTSI Clinical/Translational Research Pilot**  
*Award:* Pilot Grant  
*Title:* “Integrating electromyography and sonographic imaging for evidence-based physical therapy for chronic pelvic pain”  
*Role:* PI  
*Funding:* Total Direct Costs: \$30,000  
*Overall Aims:* To combine sonography and electromyography (EMG) to obtain objective measures to enhance clinical screening and better identify Chronic Prostatitis/Chronic Pelvic Pain Syndrome (CP/CPPS) patients appropriate for physical therapy.
- 08/2012-05/2013     **University of Southern California Office of Undergraduate Programs**  
*Award:* Undergraduate Research Associates Program  
*Title:* “Undergraduate experience in translational chronic pelvic pain research”  
*Role:* PI  
*Funding:* \$6,600  
*Overall Aims:* To give 3 USC undergraduate students experience in brain, muscle, and technology aspects studying chronic pelvic pain.
- 09/2011-08/2012     **USC Dornsife Neuroscience Imaging Center**  
*Award:* Imaging Pilot  
*Title:* “Pathological insula connectivity and neural control of muscle in Chronic Prostatitis/Chronic Pelvic Pain Syndrome (CP/CPPS)”  
*Role:* PI  
*Funding:* Total Direct Costs: \$4,500

*Overall Aims:* To determine if abnormal engagement of limbic regions, particularly in connection with the insula, will be associated with pelvic muscle contraction in patients with CP/CPPS as compared with healthy controls.

08/2011-07/2012

**USC Division of Biokinesiology and Physical Therapy**

*Award:* Faculty Seed Grant

*Title:* “A critical evaluation of physical therapy for Chronic Prostatitis/Chronic Pelvic Pain Syndrome (CP/CPPS)”

*Role:* PI

*Funding:* Total Direct Costs: \$8,000

*Overall Aims:* To classify patients with CP/CPPS according to how their pelvic pain and muscle activity change in response to manual physical therapy and body awareness relaxation training. This classification will determine if targeting muscle hyperactivity with physical therapy is broadly effective for treating CP/CPPS.

#### IV. TEACHING AND MENTORING ACTIVITIES

##### Courses Developed or Presented:

###### University Courses Developed:

- Spring 2012 – Present     **PT 569: Principles of Neuroscience (4 units)**  
Course Director, 2013 - Present  
Neuroscience, taught from a basic science perspective, for second-year Doctor of Physical Therapy students. I substantially revised and developed the syllabus to include more live demos of neuroscience principles as well as examples from physical therapy practice.
- Fall 2013     **BKN 599: Writing, Wikipedia, and Wizardry in Scientific Communication (3 units)**  
Course Director  
Course for at MS and PhD students in the Biokinesiology program. Course aimed to develop scientific communication and writing skills by having students work in teams to enhance kinesiology content on Wikipedia.

###### University Courses Presented:

- Spring 2013 – Present     **BKN 550: Neurobehavioral Basis of Movement**  
I have contributed to this course with lectures titled “Motor neurons and their firing patterns: from Aplysia californica to humans living in California” and “Sensory and Perceptual Contributions to Motor Control”
- Fall 2012 – Present     **NEUR 532: Systems and Behavioral Neurobiology**  
**NSCI 525: Advanced Overview of Neurosciences II**  
I have contributed lectures in this series of courses for students in the Neuroscience Graduate Program. My lectures have been titled “Analytical

techniques in Sensorimotor Neuroscience” and “Motor neurons and their firing patterns: from Aplysia californica to humans living in California”

**Graduate Students and Post-doctoral Scholars Mentored:**

Post-Doctoral Scholars, Primary Mentor:

2018-Present                    **Amy Hegarty, PhD**  
2017-Present                    **Moheb S. Yani, PhD**  
2012-2015                        **Manku Rana, PhD**  
*Current Position:* Sr. Healthcare Econ. Analyst, UnitedHealth Group

Post-Doctoral Scholars, Ad-hoc Mentor:

2013-2015                        **Susan Duff, PhD**  
*Current Position:* Associate Professor, Department of Physical Therapy, Chapman University

Doctoral Students, Committee Chair:

2014 – Present                    **Sonja Fenske** (Neuroscience Graduate Program, USC)  
PhD Expected, 2020  
  
2012 – 2017                        **Moheb S. Yani, PhD** (Division of Biokinesiology and Physical Therapy, USC)  
PhD Received, 2017  
*Current Position:* Post-doctoral Research Associate, Division of Biokinesiology & Physical Therapy, USC  
*Awards:*

- 2015 First Place Biokinesiology Student Award. Herman Ostrow School of Dentistry Research Day
- 2017 Postdoctoral Scholar Training & Travel Award, USC Office of Postdoctoral Affairs and the USC Postdoctoral Association
- 2017 Top-ranked abstract and oral presentation invitation 3rd World Congress on Abdominal & Pelvic Pain
- 2018 Invitation to present at Physiotherapy Forum, International Continence Society
- 2018 USC Postdoctoral Scholar Training and Travel Award

Doctoral Students, Mentor:

2014 – Present                    **Alaa Albishi**  
PhD Expected, 2019  
  
2015 – 2017                        **Sarine Babikian, PhD**  
PhD Received, 2017  
*Current Position:* Data Scientist, Glooko  
  
2012 – 2014                        **Skulpan Asavasopon, PhD, MPT, OCS**  
*Current Position:* Assistant Professor, Department of Physical Therapy, Loma Linda University

*Awards:*

- 2016 California Physical Therapy Association Faculty Research Award
- 2014 Loma Linda University Dissertation Research Award

- 2014 – 2015                    **Alex Reyes, PhD**  
PhD Received, 2015  
*Current Position:* Systems Engineering and Technical Support for IARPA
- 2011-2013                    **Louise Cosand, PhD**  
PhD Received, 2013  
*Current Position:* Regional Medical Scientist at Indivior
- 2011-2012                    **Sudarshan Dayanidhi, PhD**  
PhD Received, 2012  
*Current Position:* Assistant Professor of Physical Medicine and Rehabilitation,  
Northwestern University
- 2010-2012                    **Joshua Inouye, PhD**  
PhD Received 2012  
*Current Position:* Senior R&D Engineer at Boston Scientific

Doctoral Students, Thesis Committee Member

- 2017-Present                **Hai-Jung (Steffi) Shih**  
Division of Biokinesiology and Physical Therapy, USC
- 2017-Present                **Victor Barradas**  
Department of Biomedical Engineering, USC
- 2016-Present                **Rini Varghese**  
Division of Biokinesiology and Physical Therapy, USC
- 2016-Present                **Yo Shih**  
Division of Biokinesiology and Physical Therapy, USC
- 2016-2018                    **Irene Kuo, PhD**  
Division of Biokinesiology and Physical Therapy, USC
- 2016-Present                **Andrew Hooyman**  
Division of Biokinesiology and Physical Therapy, USC
- 2017-Present                **Alexander Garbin**  
Division of Biokinesiology and Physical Therapy, USC
- 2012-2015                    **SooYeon Sun, PhD**  
Division of Biokinesiology and Physical Therapy, USC
- 2011-2015                    **Lindsey Anderson, PhD**  
Division of Biokinesiology and Physical Therapy, USC  
*Current Position:* Postdoctoral Research Fellow - Geriatric Research, Education,  
and Clinical Center - VA Puget Sound Health Care System

2010-2012                    **Cornelius Raths, PhD**  
Department of Biomedical Engineering, USC  
PhD Received, 2012  
*Current Position:* Senior Data Scientist at Veritone, Inc.

**Doctor of Physical Therapy (DPT) Students Mentored:**

2017-Present                **Gail Suchoknand**  
Assists in data collection for NIH-funded project (R01DK110669)

2017-Present                **Tessa Richards**  
Assists in data collection for NIH-funded project (R01DK110669)

2017-Present                **Chen Yang**  
Assists in data collection for NIH-funded project (R01DK110669)

2017-Present                **Alexandra Walker**  
Assists in data collection for NIH-funded project (R01DK110669)

2017-Present                **Arin Lane; Katelyn Leal**  
DPT Faculty Mentorship Program

2016-Present                **Lauren Lasorda; Erika Lark**  
DPT Faculty Mentorship Program

2015-Present                **Esther Leon; Jessica Leu**  
DPT Faculty Mentorship Program

2014-2017                    **Lucas Carr, DPT; David Gofreed, DPT**  
DPT Faculty Mentorship Program

2013-2016                    **Lindsay Wofford, DPT; Alieh Zamany, DPT**  
DPT Faculty Mentorship Program

**Undergraduate Students Mentored:**

2012-2013                    **Bashir Wyatt**  
Health and Humanity, USC

2012-2013                    **Harjot Hansra**  
Undergraduate Neuroscience Program, USC

2012-2013                    **Joey Huang**  
Department of Biomedical Engineering, USC

**High-School Students Mentored:**

2015-2016                    **Grant Givrad**  
Engineering Health Academy, Francisco Bravo Medical Magnet High School

2014-2015

**Stephanie Salome**

Engineering Health Academy, Francisco Bravo Medical Magnet High School

2011-2012

**Carlos Gomez**

Engineering Health Academy, Francisco Bravo Medical Magnet High School