

Sara J Hussain, PhD
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University of Texas at Austin
Austin, TX 78712

EDUCATION

Ph.D. University of Iowa
Human Physiology, 2011-2016

B.S. University of Iowa
Integrative Physiology, 2007-2011

ACADEMIC AND SCIENTIFIC EMPLOYMENT

Assistant Professor, 2021-present Movement and Cognitive Rehabilitation Science Program
Department of Kinesiology and Health Education
College of Education
University of Texas at Austin
Director: Sensorimotor Neuroplasticity Lab

Assistant Professor, 2021-present Assistant Professor (courtesy appointment)
Institute for Neuroscience
University of Texas at Austin

Postdoctoral fellow, 2016-2021 Human Cortical Physiology and Neurorehabilitation Section
National Institute of Neurological Disorders and Stroke
National Institutes of Health
Principal Investigator: Leonardo Cohen, MD

Research Assistant, 2013-2016 Motor Control Laboratories
Department of Health and Human Physiology
College of Liberal Arts and Sciences
University of Iowa
Principal Investigators: Kelly Cole, PhD; Warren Darling, PhD

Research Assistant, 2011-2013 Neural Control of Movement Laboratory
Department of Physical Therapy and Rehabilitation Science
Carver College of Medicine
University of Iowa
Principal Investigator: Susanne Morton, PT PhD

Research Assistant, 2009-2011 Neuromuscular Biomechanics Laboratory
Department of Physical Therapy and Rehabilitation Science
Carver College of Medicine
University of Iowa
Principal Investigator: Laura Frey Law, PT PhD

PUBLICATIONS

* corresponding author / † mentee

Peer-reviewed original research

1. **Hussain SJ**, Vollmer MK†, Iturrate I, Quentin R. Voluntary motor command release coincides with restricted sensorimotor beta rhythm phases. *Journal of Neuroscience*, in press.

2. ***Hussain SJ**, Quentin R. Decoding personalized motor cortical excitability states from human electroencephalography. *Scientific Reports*, 12(1), 1-12, 2022
3. ***Hussain SJ**, Vollmer MK†, Stimely JS†, Norato G, Zrenner C, Ziemann U, Buch ER, Cohen LG. Phase-dependent offline enhancement of human motor memory. *Brain Stimulation*, 14(4):873-883, 2021
 - Featured in *Intramural Research Program Weekly* (October 19, 2021)
 - Featured in *Brain Stimulation Journal Club* (November 17, 2021)
4. Baur D, Galevska D, **Hussain SJ**, Cohen LG, Ziemann U, Zrenner C. Induction of LTD-like corticospinal plasticity by low-frequency rTMS depends on pre-stimulus phase of sensorimotor μ -rhythm. *Brain Stimulation*, 13(6), 1580-1587, 2020
5. ***Hussain SJ**, Hayward W†, Fourcand F†, Zrenner C, Ziemann U, Buch ER, Hayward MK, Cohen LG. Phase-dependent transcranial magnetic stimulation of the lesioned hemisphere is accurate after stroke. Letter to the Editor, *Brain Stimulation*, 13(5):1354-1357, 2020
6. Freedberg MV, Reeves JA†, **Hussain SJ**, Zaghoul KA, Wassermann EM. Identifying site- and stimulation-specific TMS-evoked EEG potentials using a quantitative cosine similarity metric. *Public Library of Science (PLOS) One* 15(1): e0216185, 2020
7. ***Hussain SJ**, Cohen LG, Bönstrup M. Beta rhythm events predict corticospinal motor output. *Scientific Reports* 9(1):1-10, 2019
8. **Hussain SJ**, Claudino L, Bönstrup M, Norato G, Cruciani G†, Thompson R†, Zrenner C, Ziemann U, Buch ER, Cohen LG. Sensorimotor oscillatory phase-power interaction gates resting human corticospinal output. *Cerebral Cortex* 29(9):3766-3777, 2019
9. **Hussain SJ**, Frey Law LA. 3D strength surfaces for ankle plantar- and dorsi-flexion in healthy adults: an isometric and isokinetic dynamometry study. *Journal of Foot and Ankle Research* 9(1):43, 2016
10. ***Hussain SJ**, Darling WG, Cole KJ. Recent history of effector use modulates practice-dependent changes in corticospinal excitability but not motor learning. *Brain Stimulation* 9(4):584-593, 2016
11. ***Hussain SJ**, Cole KJ. No enhancement of 24-hour visuomotor skill retention by post-practice caffeine administration. *Public Library of Science (PLOS) One* 10(6):e0129543, 2015
12. **Hussain SJ**, Morton SM. Perturbation schedule does not alter retention of a locomotor adaptation across days. *Journal of Neurophysiology* 111(12):2414-2422, 2014
13. **Hussain SJ**, Hanson AM, Tseng SC, Morton SM. A locomotor adaptation including explicit knowledge and removal of post-adaptation errors induces complete 24-hour retention. *Journal of Neurophysiology* 110(4):916-925, 2013

Other peer-reviewed publications

1. **Hussain SJ**, Thirugnanasambandam N. Probing phase- and frequency-dependent characteristics of cortical neurons using combined transcranial alternating current stimulation and transcranial magnetic stimulation. *Journal of Neurophysiology* 117(6):2085-2087, 2017
2. **Hussain SJ**, Cohen LG. Exploratory studies: A crucial step towards better hypothesis-driven confirmatory research in brain stimulation. *Journal of Physiology* 595(4):1013, 2017

Open-access datasets

1. Phase-dependent offline enhancement of human motor memory. <https://zenodo.org/record/4046953>
2. Single-pulse open-loop TMS-EEG dataset. <https://openneuro.org/datasets/ds002094>
3. No enhancement of 24-hour visuomotor skill retention by post-practice caffeine administration. <https://doi.org/10.5061/dryad.j91v7.2>

SCHOLARLY PRESENTATIONS

Invited talks

1. *Uncovering oscillatory mechanisms of human motor control with phase-dependent TMS*. 3rd International Workshop on Non-invasive Brain Stimulation (6/9/2022). In person, Minneapolis, MN.
2. *Decoding motor cortical excitability: towards personalized brain state-dependent TMS*. University of Oxford Nuffield Department of Clinical Neurosciences Physiological Neuroimaging Group (4/29/2022). Conducted virtually.
3. *Sensorimotor rhythmic control of human motor function: the essential role of phase*. University of Alabama at Birmingham Human Neuroscience and Systems Colloquium (5/20/2022). Conducted virtually.
4. *Enhancing motor behavior with brain state-dependent transcranial magnetic stimulation*. Brain Stimulation Journal Club (11/17/2021). Conducted virtually.

5. *Brain waves and movement: the importance of phase*. India Institute of Technology Gandhinagar Center for Brain and Cognitive Sciences Brain Awareness Week (3/15/2021). Conducted virtually
6. *Characterizing oscillatory mechanisms of human motor control: towards therapeutic closed-loop brain stimulation*. University of Texas at Austin Department of Electrical and Computer Engineering, Clinical Neuroprosthetics and Brain Interaction Laboratory (1/12/2020). Conducted virtually.
7. *Sensorimotor rhythmic control of human motor function*. University of Maryland School of Medicine Rehabilitation Seminar Series (2/28/2020). In person, Baltimore, MD.
8. *Evaluating rhythmicity of corticospinal motor output after stroke*. National Institutes of Health and Johns Hopkins University School of Medicine Clinical Neuroscience Grand Rounds (11/12/2019). In person, Bethesda, MD.

Symposia

1. Chair and Speaker (co-chair: Christoph Zrenner). Symposium title: *Brain oscillation-dependent TMS of the human motor system: from basic science to therapeutic applications*. Talk title: *Mu phase-dependent TMS reveals the cyclic nature of motor memory consolidation*. 7th International Conference on Non-invasive Brain Stimulation (11/10/2020). Conducted virtually due to COVID-19.
2. Speaker. *Phase-dependent enhancement of skill consolidation in human cortex*. Society for the Neural Control of Movement Award Winners Virtual Symposium (6/11/2020). Conducted virtually due to COVID-19.

Platform presentations

1. *An open-loop TMS study evaluating the impact of mu and beta oscillations on motor-evoked potential amplitudes*. 31st International Congress of Clinical Neurophysiology (2018). Washington, DC.

Selected poster presentations

1. Suresh T, Iwane F, Zhang M, **Hussain SJ**. Learning-related corticospinal plasticity is sensorimotor mu phase-dependent. Society for Neuroscience Annual Meeting (2022). San Diego, CA.
2. **Hussain SJ**, Vollmer MK, Iturrate I, Quentin R. Voluntary motor commands are preferentially released during restricted sensorimotor beta rhythm phases. Society for Neuroscience Annual Meeting (2021). Conducted virtually.
3. **Hussain SJ**, Quentin R. Decoding individualized motor cortical excitability states from whole-brain electroencephalography. 2nd International Workshop on Non-Invasive Brain Stimulation (6/2021). Conducted virtually due to COVID-19.
4. Vollmer MK, **Hussain SJ**, Quentin R, Iturrate I, Cohen LG. Sensorimotor mu phase-dependency of self-paced movement initiation. Society for Neuroscience Annual Meeting (2019). Chicago, IL.
5. **Hussain SJ**, Vollmer MK, Norato G, Zrenner C, Buch ER, Ziemann U, Cohen LG. Cyclic consolidation of human motor memory. Society for Neuroscience Annual Meeting (2019). Chicago, IL.
6. **Hussain SJ**, Claudino L, Bönstrup M, Norato G, Zrenner C, Ziemann U, Buch ER, Cohen LG. Sensorimotor oscillatory phase-power interactions determine human corticospinal output. Society for Neuroscience Annual Meeting (2018). San Diego, CA.
7. **Hussain SJ**, Claudino L, Bönstrup M, Norato G, Zrenner C, Ziemann U, Buch ER, Cohen LG. Sensorimotor oscillatory shapes rhythmic fluctuations in human corticospinal excitability. Society for the Neural Control of Movement Annual Meeting (2018). Santa Fe, NM.
8. **Hussain SJ**, Bönstrup M, Claudino L, Cruciani G, Thompson R, Buch ER, Cohen LG. Effects of brain oscillatory phase and power on TMS effect: an open-loop study. Society for Neuroscience Annual Meeting (2017). Washington, DC.
9. Claudino L, **Hussain SJ**, Buch ER, Cohen LG. Modeling variability induced by coil positioning enhanced detection of TMS effects. Society for Neuroscience Annual Meeting (2017). Washington, DC.
10. Buch ER, **Hussain SJ**, Claudino L, Bönstrup M, Thompson R, Cruciani G, Cohen LG. Cross-frequency coupling between alpha- and gamma-band sensorimotor cortex oscillations does not covary with corticospinal excitability at rest. Society for Neuroscience Annual Meeting (2017). Washington, DC.
11. **Hussain SJ**, Darling WG, Cole KJ. Effects of prior hand use on practice-dependent plasticity and ballistic motor skill learning. Society for Neuroscience Annual Meeting (2015). Chicago, IL.
12. **Hussain SJ**, Cole KJ. No effect of post-practice caffeine ingestion on 24-hour retention of a visuomotor skill. Society for the Neural Control of Movement Annual Meeting (2015). Charleston, SC.
13. **Hussain SJ**, Cole KJ. No enhancement of 24-hour visuomotor skill retention by post-practice caffeine administration. Aging Mind and Brain Institute Annual Symposium (2015). Iowa City, IA.

14. **Hussain SJ**, Morton SM. The effect of gradual vs. abrupt perturbations on retention of a locomotor adaptation. Society for Neuroscience Annual Meeting (2013). San Diego, CA.
15. **Hussain SJ**, Morton SM. The effect of gradual versus abrupt error on 24-hour retention of a visuomotor locomotor adaptation. Society for Neuroscience Annual Meeting (2012). New Orleans, LA.
16. **Hussain SJ**, Frey Law LA. Normative 3D strength surfaces in healthy subjects at the ankle joint: plantarflexion and dorsiflexion. Iowa Undergraduate Research in the Capitol (2011). Des Moines, IA.
17. **Hussain SJ**, Frey Law LA. Normative 3D strength surfaces in healthy subjects at the ankle joint: plantarflexion and dorsiflexion. University of Iowa Fall Undergraduate Research Festival (2010). Iowa City, IA.

FUNDING

Current

1. *Developing personalized brain state-dependent TMS to target residual corticospinal connections after stroke*
Neurorehabilitation and Restorative Neuroscience Training Network (K12HD093427)
National Center for Medical Rehabilitation Research
National Institute of Child Health and Human Development
Role: Scholar
Direct costs: \$250,000
Award period: 8/2022 – 7/2024

Completed

1. *Effects of closed-loop TMS on human motor function*
Competitive Fellowship Award
National Institutes of Neurological Disorders and Stroke Intramural Research Program
Role: PI
Direct costs: \$264,000
Award period: 4/2018 – 12/2020

HONORS AND AWARDS

External

1. Finalist, Interdisciplinary Rehabilitation Engineering Research Career Development Program (2021). Department of Physical Therapy and Human Movement Sciences at Northwestern University.
2. Young Investigator Annual Meeting Scholarship Award (2020). Society for the Neural Control of Movement.
3. Trainee Professional Development Award (2015). Society for Neuroscience.

Institutional

1. National Center for Faculty Development and Diversity Awardee (2022). University of Texas at Austin.
2. Virtual Conference Registration Faculty Grant (2021). University of Texas at Austin.
3. Post-Comprehensive Exam Summer Research Fellowship (2015). University of Iowa Graduate College.
4. Ray-Tai and Ray-Fong Chang Scholarship (2015). University of Iowa Department of Health and Human Physiology.
5. Research Project Grant (2013, 2015). University of Iowa Graduate and Professional Student Government.
6. Travel Grant (2013). University of Iowa Graduate and Professional Student Government.
7. Summer Research Fellowship (2010). University of Iowa Center for Undergraduate Research.

STUDENT SUPERVISION

Theses, Dissertations, and Comprehensive Examinations

1. Reader, Master's report for Drew Morrison. University of Texas at Austin Department of Kinesiology and Health Education, 2021.
2. Member, Dissertation Committee for Josephine Ferrandino. University of Texas at Austin Department of Kinesiology and Health Education, 2020-2021.
3. Member, Dissertation Committee for Timothy Lowe. University of Texas at Austin Department of Kinesiology and Health Education, 2020-2021.

4. Member, Comprehensive Examination Committee for Donald (Mac) Prible. University of Texas at Austin Department of Kinesiology and Health Education, 2022.
5. Member, Comprehensive Examination Committee for Xin Yu. University of Texas at Austin Department of Kinesiology and Health Education, 2022.

University of Texas at Austin

1. Ningzhen Zhao (MS student, 2021-present, co-advised with Lisa Griffin)
2. Grace Johnston (undergraduate summer intern, 2022)
3. Kristen Pulliam (undergraduate, 2022-present)
4. Maggie McElmurry (undergraduate, 2021-present)
5. Tiffany Lin (undergraduate, 2021-2022)
6. Tushar Talaparthy (undergraduate, 2021)
7. Tharan Suresh (PhD student, 2021-present)
8. Uttara Khatri (PhD student, 2021-present)
9. Rahmawati Rahmwati (PhD student, 2021-present, co-advised with Michael Freedberg)

National Institutes of Neurological Disorders and Stroke

1. William Hayward (neurology resident, 2020-2021)
2. Farah Fourcand (neurology resident, 2018-2019)
3. Goldy Yadav (PhD student, 2019-2020)
4. Jessica Stimely (postbaccalaureate fellow, 2018-2020)
5. Mary "Katie" Vollmer (postbaccalaureate fellow, 2017-2019)
6. Ryan Thompson (postbaccalaureate fellow, 2016-2017)
7. Gabriel Cruciani (postbaccalaureate fellow, 2016-2017)
8. Sanjna Iyengar (undergraduate student, 2018)
9. Selina Williams (undergraduate student, 2016)

University of Iowa

1. Ryan Wenzel (MS student, 2014-2015)
2. Shauna Dummett (DPT student, 2014)
3. Alison Charipar (DPT student, 2014)
4. Benjamin Grothe (undergraduate student, 2015-2016)
5. Alexis Koch (undergraduate student, 2014-2016)
6. Zachary Wendland (undergraduate student, 2015-2016)
7. Ana Glavas (undergraduate student, 2014-2016)

SERVICE

Ad-hoc reviewer: *Brain Stimulation, Cerebral Cortex, Journal of the American Medical Association (JAMA), Medicine & Science in Sports and Exercise, Nature Communications, Nature Neuroscience, Nature Human Behavior, NeuroImage, Neuromodulation: Technology at the Neural Interface, Neurorehabilitation and Neural Repair, Scientific Reports*

Institutional

1. Interviewer, Institute for Neuroscience PhD Program. University of Texas at Austin, 2022.
2. Member, Merit Review Committee – Service. University of Texas at Austin Department of Kinesiology and Health Education, 2021-2022.
3. Member, Tenure-Track Assistant/Associate Professor in Movement and Cognitive Rehabilitation Science Search Committee. University of Texas at Austin Department of Kinesiology and Health Education, 2021-2022.
4. Chair, Undergraduate Motor Learning Laboratory Redesign Committee. Department of Kinesiology and Health Education, 2021.
5. Interviewer, Institute for Neuroscience PhD Program. University of Texas at Austin, 2021.
6. Member, Whole Communities – Whole Heath Faculty Search Committee. University of Texas at Austin College of Education, 2020-2021.
7. Poster judge, Cellular to Clinically Applied Rehabilitation Research and Engineering (CARE) Research Day, 2021.

8. Member, Graduate Studies Committee. University of Texas at Austin Department of Kinesiology and Health Education, 2020-present.
9. Member, Subvention Committee (Recruitment). University of Texas at Austin Department of Kinesiology and Health Education, 2020-2021.
10. Member, Movement and Cognitive Rehabilitation Science Area Advisory Committee. University of Texas at Austin Department of Kinesiology and Health Education, 2020-2021.
11. Volunteer, Health Sciences Visit Day. University of Iowa Carver College of Medicine, 2015.
12. Volunteer, Eastern Iowa Brain Bee. University of Iowa Interdisciplinary Program in Neuroscience, 2014-2016.
13. Panelist, Applying to Graduate School Workshop. University of Iowa Women in Science and Engineering, 2014.
14. Volunteer, You at UIOWA Visit Day. University of Iowa Department of Health and Human Physiology, 2014-2016.
15. Poster Judge, Research Festival. University of Iowa Center for Undergraduate Research, 2013.
16. Chair, Social and Service Committee. University of Iowa Graduate Student Senate, 2011.
17. Member, University of Iowa Graduate Student Senate, 2011.

Community talks

1. *Personalized non-invasive brain stimulation for recovery of hand function after stroke*. Brainwaves Brain Injury Support Group. (8/11/2022) In person, Lakeway, TX.
2. *Personalized non-invasive brain stimulation for recovery of hand function after stroke*. Central Austin Stroke Support Group. (8/8/2022) Conducted virtually, Austin, TX.

TEACHING

Instructor, University of Texas at Austin

1. KIN 335C: Motor Learning (Spring 2021, Fall 2021, Spring 2022)
2. KIN 395C: Motor Control: Performance and Learning (Spring 2021)

Guest Lecturer, University of Texas at Austin

1. KIN 397: Seminar in Movement and Cognitive Rehabilitation Science (Spring 2021, Spring 2022)

Teaching Assistant, University of Iowa (2013-2016)

1. HHP 3300: Human Growth and Motor Development
2. HHP 1100: Human Anatomy
3. HHP 4130: Skeletal Muscle Physiology
4. HHP 4470: Physiology of Aging