

Shahabeddin Vahdat, PhD

Assistant Professor

Department of Applied Physiology and Kinesiology

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Education

- **Doctor of Philosophy, McGill University, Montreal, Canada**
2008 - 2012; with Drs. T. Milner and D. Ostry, Kinesiology [Motor Neuroscience]; GPA: 3.82/4
Thesis title: “Training-induced Plasticity in Resting-state Sensory and Motor Networks”
- **Master of Science, Sharif University of Technology, Tehran, Iran**
2005 - 2008; Biomedical Engineering; GPA: 3.80/4
Thesis title: “Analysis and Modeling of Motor Synergies in Human Motor Control”
- **Bachelor of Science, University of Tehran (UT), Tehran, Iran**
2001 - 2005; Electrical Engineering – System Control
Project title “Development of a Robust Brain Extraction Algorithm in Structural MRI”

Professional Experience

- **Assistant Professor, University of Florida, Gainesville, FL, USA**
2019 - Present – Department of Applied Physiology and Kinesiology, College of Health and Human Performance, Director of Sensorimotor Plasticity Lab (SPL)
- **Postdoctoral Fellow, Stanford University, Stanford, CA, USA**
2017 - 2019; with Drs. Gary Steinberg and Jin Hyung Lee, Department of Neurosurgery, and Department of Neurology and Neurological sciences
Project: Neurotreatment and pathophysiology of ischemic stroke
- **Postdoctoral Fellow, University of Montreal, Montreal, QC, Canada**
2012 - 2017; with Dr. Julien Doyon, Functional Neuroimaging Unit, CRIUGM
Project 1: Spinal cord functional neuroimaging and electrophysiology
Project 2: Sleep-dependent consolidation of motor memory
- **Visiting Scientist, McGill University, Montreal, Canada**
2012 - 2016; with Dr. David Ostry
Project: Neuroimaging of perceptual learning after stroke

Grant Funding

- **APK Research Investment Grants, Center for Exercise Science, University of Florida**, “Spinal cord circuit function and interaction with the brain in stroke recovery” Principal investigator, (PIs: Shahabeddin Vahdat, Stephen Coombs); 2020-2022, \$23,300 USD
- **Heart and Stroke Foundation of Canada Grants-in-Aid (GIA)**: “Robot-assisted modulation of post-stroke motor-network connectivity: from basic science to clinical application”. Co-applicant (PI: Alexander Thiel, David Ostry), 2016-2018; 213,000 CAD
- **Oxford-McGill Neuroscience Collaboration Grant**: “Connectivity and communicability in the sensorimotor network during motor learning following stroke”. Co-applicant (PI: Theodore Milner, McGill; Charlotte Stagg, Oxford), 2012-2014 ; 24,000 CAD

Honors & Awards

- **Canadian Institutes of Health Research (CIHR) Post-doctoral Fellowships Award**: 2016-2018; 86,000 CAD
- **Post-doctoral Fellowship Award**: SensoriMotor Rehabilitation Research Team (SMRRT; CIHR funded), 2013-2015; 80,000 CAD
- **Trainee Abstract Award**: Organization for Human Brain Mapping (OHBM) 2014, Hamburg Germany; 500 USD
- **Le Prix d’Excellence H. Catherine Sauerwein**: Best post-doctoral oral presentation award, CERNEC, St-Sauveur, 2014; 300 CAD
- **Selected for Neuroscience 2012’s pool of newsworthy research and hot topics**: Annual Meeting of the Society for Neuroscience (SFN) 2012, New Orleans, LA
- **J.W. McConnell Award**: McGill University, 2009-2011. Awarded for ranking in the top 5% of the faculty; 45,000 CAD
- **Graduate travel award**: 2011-2012, Kinesiology Department, McGill, QC ; 1500 CAD
- **Principal’s & Provost’s Graduate Fellowship**: McGill university, 2008; 10,000 CAD
- **Best Session Presentation Award**: IEEE World Congress on Computational Intelligence, Vancouver, BC, July 2006; 400 CAD
- **73th Rank in M.Sc national entrance exam**: Electrical and Biomedical Engineering among 15,000 participants, Iran, 2005
- **170th Rank in B.Sc nationwide university exam**: Among 368,404 participants, Iran, 2001
- **Selected as “Exceptional Talents”**: By “National Organization for Educational Testing”, Tehran, Summer 2001

Peer-Reviewed Articles

- **Vahdat S, Pendharkar AV, Harvey S, Chiang T, Lee HJ, Cheng M, Lee JH, Steinberg G** “Brain wide circuit dynamics of post-stroke recovery induced by optogenetic stimulation”, *under review*

- Babadi S, **Vahdat S**, Milner T, “Neural substrates of muscle co-contraction during dynamic motor adaptation”, *under review*
- **Vahdat S**, Khatibi A, Lungu O, Finsterbusch J, Christian B, Cohen-Adad J, Marchand-Pauvert V, Doyon J. (2020) “Resting-state brain and spinal cord networks in humans are functionally integrated”, *PLoS Biology*, <https://doi.org/10.1371/journal.pbio.3000789>
- Cheng MY, **Vahdat S**, Pendharkar AV, Harvey S, Chiang T, Lee HJ, Lee JH, Steinberg G (2020) “Brain-wide circuit dynamics of post-stroke recovery after optogenetic stimulation”, *Stroke*, 51 (Suppl_1), A177-A177
- **Vahdat S**, Darainy M, Thiel A, Ostry DJ, (2019) “A single session of robot-controlled proprioceptive training modulates functional connectivity of sensory-motor networks and improves reaching accuracy in chronic stroke”; *Neurorehabilitation & Neural Repair*. Jan;33(1):70-81.
- Darainy M, **Vahdat S**, Ostry DJ. (2019) “Neural basis of sensorimotor learning in speech motor adaptation”, *Cerebral Cortex*, 29(7):2876-2889.
- Gros C, De Leener B, ..., **Vahdat S**, ..., Cohen-Adad J, (2019), “Automatic segmentation of the spinal cord and intramedullary multiple sclerosis lesions with convolutional neural networks”, *Neuroimage*, 184, 901-915
- Bernardi NF, Van Vugt FT, Valle-Mena R, **Vahdat S**, Ostry DJ. (2018) “Error-related persistence of motor activity in resting state networks”. *Journal of Cognitive Neuroscience*, Aug 20:1-19
- Doyon J, Gabbitov E, **Vahdat S**, Lungu O, Boutin A, (2018) “Current issues related to motor sequence learning in humans”, *Current Opinion in Behavioral Sciences*, Volume 20, April 2018, Pages 89-97
- **Vahdat S**, Fogel S, Benali H, Doyon J. (2017) “Network-wide reorganization of procedural memory during non-REM sleep revealed by fMRI”. *eLife*, 2017; 6: e24987.
- Featured by *eLife Insight articles*: HV Ngo, BP Staresina (2017) “Sleep: Shifting memories”; *eLife* 2017;6:e30774
- Interviewed and featured by *New Scientist*: J Hamzelou (2017) “We’ve finally seen how the sleeping brain stores memories”, Magazine issue 3146
- **Vahdat S**, Albouy G, King B, Lungu O, Doyon J, (2017) “Editorial: online and offline modulators of motor learning”. *Frontiers in Human Neuroscience*. 11:6, doi: 10.3389
- Sidarta, A., **Vahdat S**, Bernardi N, Ostry DJ, (2016) “Somatic and reinforcement-based plasticity in the initial stages of human motor learning” *Journal of Neuroscience*, 16;36(46):11682-11692.
- Maneshi M, **Vahdat S**, Grova C, Gotman J, (2016) “Validation of shared and specific independent components analysis (SSICA) for between groups comparison in fMRI”. *Brain Imaging Methods: Frontiers in Neuroscience*, 10:417.

- **Vahdat S**, Lungu O, Cohen-Adad J, Marchand-Pauvert V, Benali H, Doyon J, (2015) “Simultaneous brain-cervical cord fMRI reveals intrinsic spinal cord plasticity during motor sequence learning”, *PLOS Biology*; 13(6):e1002186.
Featured by PLoS Biology Synopsis: Robinson R (2015) Learning with the Spinal Cord. PLoS Biology 13(6): e1002187. Weekly Editor's Picks at PLoS Biology's homepage.
- Thiel A, **Vahdat S**, (2015) “Structural and resting-state brain connectivity of motor networks after stroke”, *Stroke*; 46(1):296-301.
- Maneshi M, **Vahdat S**, Fahoum F, Grova C, Gotman J, (2014) “Specific resting-state brain networks in mesial temporal lobe epilepsy”, *Frontiers in Neurology*; 5:127.
- **Vahdat S**, Darainy M, Ostry DJ, (2014) “Structure of Plasticity in Human Sensory and Motor Networks Due to Perceptual Learning”, *Journal of Neuroscience*, 34(7):2451-2463.
Featured in Neurology Today: Valeo T (2012) Human-machine Interface to Explore Neuroplasticity in Stroke, Neurology Today: 6 December 2012 – V. 12 – Issue 23 - p 36–39
- Darainy M*, **Vahdat S***, Ostry DJ, (2013) “Perceptual Learning in Sensorimotor Adaptation”, *Journal of Neurophysiology*, 110(9):2152-62. * *Equal contribution*
- **Vahdat S**, Maneshi M, Grova C, Gotman J, Milner TE, (2012) “Shared and Specific Independent Components Analysis for Between-Groups Comparison”, *Neural Computation*, 24(11):3052-90.
- **Vahdat S**, Darainy M, Milner TE, Ostry DJ, (2011) “Functionally specific changes in resting-state sensorimotor networks following motor learning”, *Journal of Neuroscience*; 31(47):16907-15.
Received an Editorial commentary: The Neuroscientist (2012) Does motor learning affect sensory systems? Neuroscientist, April 2012 vol. 18 no. 2 105
- Salman B*, **Vahdat S***, Lambercy O, Dovat L, Burdet E, Milner TE, (2010) “Changes in Muscle Activation Patterns Following Robot-assisted Training of Hand Function after Stroke”, *Intelligent Robots and Systems, Proceedings of IEEE/RSJ*, P.5145-5150, DOI:10.1109/IROS.2010.5650175. * *Equal contribution*
- Bayati H, **Vahdat S**, VosoughiVahdat B, (2009) “Shared and Specific Synchronous Muscle Synergies Arisen from Optimal Feedback Control Theory”, *Neural Engineering, Proceeding of IEEE EMBS*, P.155-158. DOI:10.1109/NER.2009.5109258.
- Bayati H, **Vahdat S**, VosoughiVahdat B, (2009) “Investigating the properties of optimal sensory and motor synergies in a nonlinear model of arm dynamics” *Neural Networks, Proceeding of the IJCNN*, P.272-279. DOI:10.1109/IJCNN.2009.5178941.
- **Vahdat S**, Maghsoudi A, Hajihasani M, Towhidkhah F, Gharibzadeh S, Jahed M, (2006) “Adjustable primitive pattern generator: a novel cerebellar model for reaching movements”, *Neuroscience Letters*; 406(3):232-4.

- Mehrtash A, **Vahdat S**, Soltanian-Zadeh H, (2006) “Fuzzy Edge Preserving Smoothing Filter Using Robust Region Growing” *Fuzzy Systems, Proceedings of IEEE on Computational Intelligence*, P.1748 – 1755, DOI: 10.1109/FUZZY.2006.1681942.

Book Chapter

- Doyon J, Albouy G, **Vahdat S**, King B, (2015) “Neural correlates of motor skill acquisition and consolidation”, In: Toga A (Eds.) *Brain Mapping: An Encyclopedic Reference*. Elsevier, ISBN: 978-0-12-397316-0.

Manuscripts in Preparation

- **Vahdat S**, Khatibi A, Lungu O, Marchand-Pauvert V, Doyon J. “Spinal inhibitory processes in human motor sequence learning”, *in prep*
- Khatibi A*, **Vahdat S***, Finsterbusch J, Lungu O, Cohen-Adad J, Marchand-Pauvert V, Benali H, Doyon J. “Spinal cord contribution to long-term motor skill learning”, *in prep*, *
Equal contribution

Academic Talks

- Fixel Institute for Neurological Diseases, University of Florida 2019
- APK, Center of Exercise Science, University of Florida 2019
- Neuroscience program, Worcester Polytechnic Institute (WPI), MA 2019
- Center for Brain, Biology & Behavior, University of Nebraska 2018
- BME Seminar Series, Special Rehabilitation Engineering Seminar, UNC, Chapel Hill 2018
- Oral session presentation, 46th Society for Neuroscience, San Diego 2016
- CRIUGM and CAREC Scientific Day; Montreal Geriatric Institute, Montreal, QC 2016
- Conference midi; CRIUGM; University of Montreal, QC 2015
- The Feindel Brain Imaging Lecture Series; Montreal Neurological Institute; Montreal, 2015
- Montreal Resting-State fMRI Workshop, McGill University, Montreal 2014
- Oral session presentation, Human Brain Mapping annual meeting, Hamburg Germany 2014
- Oral session presentation, Society for the Neural Control of Movements, Amsterdam 2014
- Nano-symposium talk, 43rd Society for Neuroscience, San Diego 2013
- Platform presentation, Canadian Spinal Cord Conference, Halifax 2013
- Oral session presentation, Society for the Neural Control of Movements, Venice 2012

Conference Presentations

- Cheng M, **Vahdat S**, Pendharkar AV, Harvey S, Chiang T, Lee HJ, Lee JH, Steinberg G “Brain-wide Circuit Dynamics Of Post-stroke Recovery After Optogenetic Stimulation”, International Stroke Conference, 2020
- **Vahdat S**, Pendharkar AV, Harvey S, Chiang T, Lee HJ, Cheng M, Lee JH, Steinberg G “Brain wide circuit dynamics of post-stroke recovery induced by optogenetic stimulation”, *Society for Neuroscience 2019, Chicago*.

- Choy M, Duffy B, Schmid F, Edelman B, Assaad M, Chan R, **Vahdat S**, Lee JH, “Imaging individual hippocampal seizures and the long-term impact of repeated seizures”, American Epilepsy Society (AES) annual meeting, 2019
- **Vahdat S**, Cheng M, Ito M, Lee HJ, Steinberg G, Lee JH “Short-term brain network changes following repeated optogenetic M1 stimulation”, Nano-symposium presentation, *Society for Neuroscience 2018, San Diego*.
- **Vahdat S**, Souyer C, Lungu O, Finsterbusch J, Marchand-Pauvert V, Cohen-Adad J, Benali H, Doyon J. “Resting-state spinal cord-brain networks revealed by simultaneous fMRI”, *Human Brain Mapping annual meeting 2017, Vancouver*.
- **Vahdat S**, Sayour C, Black K, Lungu O, Benali H, Marchand-Pauvert V, Doyon J, “Inhibitory mechanisms of the human spinal cord associated with motor sequence learning”. *Nonosymposium, 46th Annual Meeting of the Society for Neuroscience, 2016, San Diego*.
- **Vahdat S**, Lungu O, Cohen-Adad J, Marchand-Pauvert V, Benali H, Doyon J, “Contribution of the Spinal Cord and its Interaction with the Brain during Motor Sequence learning”. *Human Brain Mapping annual meeting 2015, Honolulu, Hawaii*.
- **Vahdat S**, Fogel S, Benali H, Doyon J, “On-line, off-line, and sleep dependent consolidation of motor sequence learning revealed by fMRI”, *Human Brain Mapping annual meeting 2014, Hamburg Germany*.
- **Vahdat S**, Darainy M, A. Thiel A, Ostry DJ, “Plasticity in human motor system induced by somatosensory training in stroke patients”, *44th Annual Meeting of the Society for Neuroscience, Nov. 2014, Washington*.
- **Vahdat S**, Lungu O, Cohen-Adad J, Marchand-Pauvert V, Benali H, Doyon J, “Parsing out brain-spinal cord contributions to motor learning using fMRI”, *Society for the Neural Control of Movements, April 2014, Amsterdam*.
- **Vahdat S**, Lungu O, Doyon J, “Learning-dependent changes in spine-brain interaction revealed by functional magnetic resonance imaging”, *43th Annual Meeting of the Society for Neuroscience, Nov. 2013, San Diego*.
- **Vahdat S**, Ostry DJ, Darainy M, “Plasticity in motor system induced by somatosensory training”, *42nd Annual Meeting of the Society for Neuroscience, New Orleans, LA, 2012*.
- **Vahdat S**, Maneshi M, Grova C, Gotman J, Milner TE, “Shared and Specific Independent Component Analysis for Between-Group Comparison”, *19th Human Brain Mapping annual meeting 2012, Beijing China*.
- Maneshi M, **Vahdat S**, Grova C, Gotman J, “Validation of a new ICA-based method for between-group comparisons in fMRI”, *19th Human Brain Mapping annual meeting 2012, Beijing China*.
- **Vahdat S**, Darainy M, Milner TE, Ostry DJ, “Motor learning alters sensorimotor resting-state networks in the brain”, *41st Annual Meeting of the Society for Neuroscience, Washington, DC, 2011*.
- **Vahdat S**, "Brain Extraction in MRI using a novel integrated method of edge detection and region growing", *2nd annual symposium of ECE young researcher, 2004, Tehran*.

- **Vahdat S**, "Fully automatic extraction of the brain in T1-weighted MRI", *first annual symposium of ECE young researcher, 2003, Tehran.*

Teaching Experiences

- Lecturer: "Movement Neuroscience" (APK 4144), Department of Applied Physiology and Kinesiology, University of Florida, Spring 2020
- Guest lecturer: "Biomechanics and Motor Learning", instructor: Dr. P. Stapley, Kinesiology, McGill University, Winter 2011
- Guest lecturer: "Motor control", instructor: Dr. T. Milner; Kinesiology, McGill, Fall 2011
- Teaching assistant: "Motor control", by Dr. Milner, McGill, 2011
- Teaching assistant: "Intro to Psychological Stats", by Dr. Ostry, McGill, 2011
- Teaching assistant: "Biomechanics and Motor Learning", by Dr. P. Stapley, McGill, 2011
- Teaching assistant: "Biomechanics of Human Movement", by Dr. Pearsall, McGill, 2010
- Teaching assistant: "Motor Development", by Dr. Reid, McGill University, Fall 2009-2010
- Teaching and laboratory assistant: "Biomechanics of Human Movement", by Dr. Milner, McGill University, Winter 2009
- Lecturer: "Electronics II", Iranian Academic Centre for Education, Culture & Research, Spring 2006
- Teaching assistant: "Linear control systems", University of Tehran, 2004
- Teaching assistant: "Probabilities and statistics", University of Tehran, Fall & Spring 2003

Mentorship/Supervision Experiences

- **Supervisor**, Rose Roberts, Project title: "Rodent motor learning and optogenetic fMRI", Department of Applied Physiology and Kinesiology, *University of Florida, 2020*
- **Supervisor**, Cho Lun Chiang, Project title: "Electromyographic correlates of motor learning", Biomedical Engineering Department, *University of Florida, 2020*
- **Supervisor**, Jasmine Singh, Project title: "Spinal cord reflex control in human motor learning", Biomedical Engineering Department, *University of Florida, 2020*
- **Supervisor**, Sushain Kaul, Project title: "Optogenetic fMRI in rodents spinal cord", Biomedical Engineering Department, *University of Florida, 2020*
- **Principal supervisor** of Jennifer Taing, Bachelor's internship; Project title "Spinal cord long term plasticity revealed by fMRI"; *University of Montreal, 2016*
- **Principal supervisor** of Karine Després, Bachelor's internship; Project title "Spinal cord inhibitory mechanisms using nerve stimulation"; *University of Montreal, 2016*
- **Principal supervisor** of Kelly Black, Bachelor's internship; Project title "Spinal cord electrophysiological mechanisms in motor learning"; *University of Montreal, 2015*
- **PhD project advisor** of Chadi Sayour, principal supervisor Dr. Julien Doyon, *University of Montreal, 2014-present*

- **Principal supervisor** of Vincent Cote Provencher, Bachelor's stage, Project: "Functional imaging of spinal cord during a motor learning task" *University of Montreal, 2014*
- **Master's project advisor** of Atousa Assadi, principal supervisor Dr. Theodore Milner, *McGill University, 2014-present*
- **PhD project advisor** of Saeed Babadi, principal supervisor Dr. Theodore Milner, *McGill University, 2013-present*
- **PhD project consultant** of Ananda Sidarta, principal supervisor Dr. David Ostry, *McGill University, 2013-present*
- **Master's project consultant** of Zeinab Firouzimehr, principal supervisor Dr. Theodore Milner, *McGill University, 2009-2011*

Professional Societies

- Society for Neuroscience
- American Stroke Association
- Neural Control of Movement
- Organization for Human Brain Mapping
- International Society for Magnetic Resonance in Medicine