

# Heather R. McGregor

POSTDOCTORAL FELLOW | NEUROMOTOR BEHAVIOR LABORATORY

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## Education

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### Postdoctoral Fellowship

THE UNIVERSITY OF FLORIDA

Advisor: Dr. Rachael Seidler

Gainesville, FL

2018–present

### Ph.D. in Neuroscience

THE UNIVERSITY OF WESTERN ONTARIO

Advisor: Dr. Paul Gribble

London, ON

2018

### Visiting Doctoral Research Fellowship

THE UNIVERSITY OF QUEENSLAND

Advisor: Dr. Timothy Carroll

Brisbane, QLD

2018

### Honours B.Sc. in Psychology, Neuroscience & Behaviour

McMASTER UNIVERSITY

Advisor: Dr. Ramesh Balasubramaniam

Hamilton, ON

2011

## Publications

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\* Mentored trainees

15. **McGregor HR**, Lee JK, Mulder E, Beltran NE, Kofman IS, De Dios YE, Bloomberg JJ, Mulavara AP, Smith SM, Zwart SR, Seidler RD (Submitted). Ophthalmic changes in a spaceflight analog are associated with brain functional reorganization. *Under Revision*
14. \*Hupfeld KE, **McGregor HR**, Reuter-Lorenz PA, Seidler RD (Under Revision ). Microgravity effects on the human brain and behavior: Dysfunction and adaptive plasticity. *Neuroscience & Biobehavioral Reviews* 122: 176–189.
13. Roberts DR, Collins HR, Lee JK, Taylor JA, Turner M, Zaharchuk G, Wintermark M, Antonucci M, Mulder E, Asemani D, **McGregor HR**, Seidler RD (2021). Altered cerebral perfusion in response to chronic mild hypercapnia and head-down tilt Bed rest as an analog for Spaceflight. *Neuroradiology* 1–11
12. **McGregor HR**, Lee JK, Mulder E, Beltran NE, Kofman IS, De Dios YE, Bloomberg JJ, Mulavara AP, Seidler RD (2021). Brain connectivity and behavioral changes in a spaceflight analog with elevated CO<sub>2</sub>. *NeuroImage* 117450
11. Goldenkoff ER, **McGregor HR**, Mergos J, Gholizadeh P, Bridenstine J, Brown MJN, Vesia M (Under Revision). Reversal of visual feedback modulates somatosensory plasticity. *Neuroscience* 452:

10. Hupfeld KE, **McGregor HR**, Lee JK, Beltran E, Koffman IS, De Dios YE, Reuter-Lorenz PA, Riascos R, Pasternak O, Wood SJ, Bloomberg JJ, Mulavara AP, Seidler RD (2020). The impact of six and twelve months in space on human brain structure and intracranial fluid shifts. *Cerebral Cortex Communications*, 1(1): 1–15
9. Cashaback JGA, Lao C, Palidis DJ, Coltman SK, **McGregor HR**, Gribble PL (2019). The gradient of the reinforcement landscape influences sensorimotor learning. *PLoS Computational Biology*, 15(3): e1006839
8. **McGregor HR**, Cashaback JGA, Gribble PL (2018). Somatosensory perceptual training enhances motor learning by observing. *Journal of Neurophysiology*, 120(6): 3017–3025
7. **McGregor HR**, Vesia M, \*Rinchon C, Chen R, Gribble PL (2018). Changes in corticospinal excitability associated with motor learning by observing. *Experimental Brain Research*, 236(10): 2829–2838
6. **McGregor HR**, Gribble PL (2015). Functional connectivity between somatosensory and motor brain areas predicts individual differences in motor learning by observing. *Journal of Neurophysiology*, 118(2): 1235–1243
5. Cashaback JGA, **McGregor HR**, Mohatarem A, Gribble PL (2017). Dissociating error-based and reinforcement-based loss functions during sensorimotor learning. *PLoS Computational Biology*, 13(7): e1005623
4. Cashaback JGA, **McGregor HR**, Pun H, Buckingham G, Gribble PL (2017). Does the sensorimotor system minimize prediction error or select the most likely prediction during object lifting. *Journal of Neurophysiology*, 117(1): 260–274
3. **McGregor HR**, Cashaback JGA, Gribble PL (2016). Functional plasticity in somatosensory cortex supports motor learning by observing. *Current Biology*, 26(7): 921–927
2. **McGregor HR**, Gribble PL (2015). Changes in visual and sensory-motor resting-state functional connectivity support motor learning by observing. *Journal of Neurophysiology*, 114(1): 677–688
1. Cashaback JGA, **McGregor HR**, Gribble PL (2015). The human motor system alters its reaching movement plan for task-irrelevant, positional forces. *Journal of Neurophysiology*, 113(7): 2137–2149

#### SUBMITTED OR UNDER REVIEW

1. \*Hupfeld KE, **McGregor HR**, Koppelmans V, Beltran NE, Kofman IS, De Dios YE, Riascos R, Reuter-Lorenz PA, Wood SJ, Bloomberg JJ, Mulavara AP, Seidler RD (Submitted). Brain and behavioral evidence for reweighting of vestibular inputs with long-duration spaceflight.
2. Palidis D, **McGregor HR**, Vo A, MacDonald P, Gribble PL (Submitted). Null effects of levodopa on reward- and error-based motor adaptation, savings, and anterograde interference.

3. \*Tays GD, \*Hupfeld KE, **McGregor HR**, Salazar AP, De Dios YE, Beltran NE, Reuter-Lorenz PA, Kofman IS, Wood SJ, Bloomberg JJ, Mulavara AP, Seidler RD (Full draft). The effects of long duration spaceflight on cognition and sensorimotor control.

## Research Funding

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### FUNDED APPLICATIONS

2020–21	<b>NASA Human Research Program Augmentation Grant</b> National Aeronautics and Space Administration (NASA)	\$ 30,000
2019–21	<b>NSERC Postdoctoral Fellowship (<i>top committee-ranked application</i>)</b> Natural Sciences & Engineering Research Council of Canada (NSERC)	\$ 90,000
2017–18	<b>Australian Endeavour Research Fellowship</b> Government of Australia	\$ 23,500
2017–18	<b>NSERC Michael Smith Foreign Study Supplement</b> Natural Sciences & Engineering Research Council of Canada (NSERC)	\$ 6,000
2017	<b>Edmond &amp; Lily Safra Center for Brain Sciences Retreat Travel Grant</b> The Hebrew University of Jerusalem	\$ 3,000

### SUBMITTED APPLICATIONS

2021–23	<b>TRISH Postdoctoral Fellowship</b> Translational Research Institute for Space Health (TRISH), Score: 87%	\$ 120,000
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## Awards & Distinctions

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2019	<b>Nominated for Canada’s Distinguished Dissertation Award</b> Canadian Association for Graduate Students	
2018	<b>Nominated for the Governor General’s Gold Medal</b> The University of Western Ontario	
2018	<b>Nominated for the Collip Medal</b> The University of Western Ontario	
2011–17	<b>Western Graduate Research Scholarship</b> University of Western Ontario	\$ 42,000
2014–15	<b>Ontario Graduate Scholarship (<i>declined</i>)</b> Province of Ontario	\$ 15,000
2013	<b>OHBM Trainee Abstract Award</b> Organization for Human Brain Mapping	\$ 700
2012–13	<b>Ontario Graduate Scholarship</b> Province of Ontario	\$ 15,000
2011–12	<b>NSERC Canada Graduate Scholarship - Master’s Level</b> Natural Sciences & Engineering Research Council of Canada	\$ 17,500
2011–12	<b>Ontario Graduate Scholarship (<i>declined</i>)</b> Province of Ontario	\$ 15,000

## Invited Talks

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5. A Role for the somatosensory system in observational motor learning. University of Michigan, **Ann Arbor, USA**, 2018.
4. Role of the somatosensory system in motor learning by observing. Progress in Motor Control Meeting, **Miami, USA**, 2017.
3. Role of the somatosensory system in motor learning by observing. York University, **Toronto, Canada**, 2017.
2. Functional plasticity in somatosensory cortex supports motor learning by Observing. The Hebrew University of Jerusalem, **Kibbutz Ein-Gedi, Israel**, 2017.
1. The somatosensory system supports motor learning by observing. The University of Western Ontario, **London, Canada**, 2015.

## Conference Presentations

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### TALKS

7. Hupfeld KE, **McGregor HR**, Koppelmans V, Beltran NE, Kofman IS, De Dios YE, Riascos R, Reuter-Lorenz PA, Wood SJ, Bloomberg JJ, Mulavara AJ, Seidler RD (2021). Brain and behavioral evidence for reweighting of vestibular inputs with long-duration spaceflight. *Society for the Neural Control of Movement*, Online.
6. **McGregor HR**, De Dios YE, Gadd NE, Kofman IS, Bloomberg JJ, Seidler RD (2020). Effects of continuous and intermittent artificial gravity on intracranial free water distribution during head down-tilt bed rest. *NASA Human Research Program Investigators' Workshop*, Galveston, USA.
5. Salazar AP, Hupfeld KE, Lee JK, **McGregor HR**, Gadd NE, Kofman IS, De Dios YE, Mulder E, Bloomberg JJ, Mulavara AP, Seidler RD (2020). Neural spatial working memory changes during a spaceflight analog with elevated carbon dioxide. *NASA Human Research Program Investigators' Workshop*, Galveston, USA.
5. **McGregor HR**, Gribble PL (2018). Somatosensory functional plasticity supports observational motor learning. *Canadian Society for Brain, Behaviour and Cognitive Science Meeting*, St. John's, Canada.
4. **McGregor HR**, Cashaback JGA, Gribble PL (2017). The somatosensory system supports motor learning by observing. *Australasian Neuroscience Society sensorimotor satellite meeting*, Sydney, Australia.
3. Cashaback JGA, Lao C, Palidis DJ, Coltman SK, **McGregor HR**, Gribble PL (2017). The reinforcement landscape influences sensorimotor learning. *Journal of Exercise, Movement, & Sport*, St. John's, Canada.
2. Kistemaker D, Cashaback JGA, **McGregor HR**, Gribble PL (2015). The cost of moving optimally: Muscle activation selection. *International Society of Biomechanics*, Edinburgh, Scotland.
1. **McGregor HR**, Gribble PL (2013). Exploring the neural basis of observational motor learning using resting-state fMRI. *Organization for Human Brain Mapping*, Seattle, USA.

## POSTER PRESENTATIONS

32. Tays GD, Hupfeld KE, **McGregor HR**, Salazar AP, De Dios YE, Beltran NE, Reuter-Lorenz PA, Wood SJ, Bloomberg JJ, Mulavara AP, Seidler RD (2021). Sensorimotor and cognitive changes as a result of long duration spaceflight. *Society for the Neural Control of Movement*, Online.
31. **McGregor HR**, Beltran NE, De Dios YE, Kofman IS, Wood SJ, Bloomberg JJ, Reuter-Lorenz PA, Seidler RD (2021). Functional brain changes associated with balance impairments following spaceflight. *NASA Human Research Program Investigators' Workshop*, Online.
30. Tays GD, **McGregor HR**, Lee JK, Beltran NE, Mulder E, De Dios YE, Wood SJ, Bloomberg JJ, Seidler RD (2021). Does daily artificial gravity counteract head down tilt bed rest-induced brain and behavioral changes?. *NASA Human Research Program Investigators' Workshop*, Online.
29. Salazar AP, Hupfeld KE, Lee JK, **McGregor HR**, Beltran NE, Kofman IS, De Dios YE, Mulder E, Bloomberg JJ, Seidler RD (2021). Longitudinal changes in brain activity during a spaceflight analog with elevated carbon dioxide. *NASA Human Research Program Investigators' Workshop*, Online.
28. **McGregor HR**, Reuter EM, Gribble PL, Carroll TJ (2019). Greater neural responses to others' errors is associated with motor learning by observing. *Society for Neuroscience*, Chicago, IL.
27. **McGregor HR**, Lee JK, Gadd NE, Kofman IS, De Dios YE, Bloomberg JJ, Mulavara AP, Seidler RD (2019). Resting-state functional connectivity changes and ophthalmic changes associated with a spaceflight analog environment. *Society for Neuroscience*, Chicago, IL.
26. **McGregor HR**, Lee JK, Gadd NE, Kofman IS, De Dios YE, Bloomberg JJ, Mulavara AP, Seidler RD (2019). Changes in resting-state functional connectivity and behavior associated with a spaceflight analogue environment. *Society for the Neural Control of Movement*, Toyoma, Japan.
25. **McGregor HR**, Cashaback JGA, Gribble PL. (2017). The somatosensory system supports observational motor learning. *Progress in Motor Control meeting*, Miami, FL.
24. **McGregor HR**, Cashaback JGA, Gribble PL (2017). Functional plasticity in somatosensory cortex supports motor learning by observing. *Human Brain Mapping*, Vancouver, BC.
23. **McGregor HR**, Cashaback JGA, Gribble PL (2017). Somatosensory perceptual training enhances motor learning by observing. *Society for the Neural Control of Movement*, Dublin, Ireland.
22. Cashaback JGA, Lao C, **McGregor HR**, Palidis DJ, Coltman SK, Gribble PL (2017). Reinforcement gradient ascent during sensorimotor learning. *Society for the Neural Control of Movement*, Dublin, Ireland.
21. Lao C, Cashaback JGA, **McGregor HR**, Palidis D, Coltman SK, Gribble PL (2017). Ascending the reinforcement gradient during sensorimotor learning. *Southern Ontario Neuroscience Association*, St. Catherine's, ON.
20. **McGregor HR**, \*Rinchon VC, Gribble PL, Chen R, Vesia M (2016). Changes in corticospinal excitability associated with motor learning by observing. *Society for Neuroscience*, San Diego, CA.
19. **McGregor HR**, Cashaback JGA, Gribble PL (2016). Functional plasticity in somatosensory cortex supports motor learning by observing. *Society for the Neural Control of Movement*, Montego Bay, Jamaica.

18. Cashaback JGA, Mohatarem A, **McGregor HR**, Gribble PL (2016). Dissociating error-based and reinforcement-based learning. *Neural Control of Movement*, Montego Bay, Jamaica.
17. **McGregor HR**, Cashaback JGA, Gribble PL (2016). Functional plasticity in primary somatosensory cortex supports motor learning by observing. *Canadian Association for Neuroscience*, Toronto, ON.
16. Cashaback JGA, Mohatarem A, **McGregor HR**, Gribble PL (2016). Changing the form of feedback (error-based versus reinforcement-based) leads to dissociable motor adaptation. *Canadian Association for Neuroscience*, Toronto, ON.
15. Diep C, Cashaback JGA, **McGregor HR**, Gribble PL (2016). The relationship between upper limb inertia and decision making at movement initiation. *Southern Ontario Neuroscience Association*, Waterloo, ON.
14. Diep C, Cashaback JGA, **McGregor HR**, Gribble PL (2016). The influence of biomechanics during movement initiation on decision-making. *Western Student Research Conference*, London, ON.
13. **McGregor HR**, Gribble PL (2015). Resting-state functional connectivity predicts observational motor learning. *Organization for Human Brain Mapping meeting*, Honolulu, HI.
12. Cashaback JGA, Mohatarem A, **McGregor HR**, Gribble PL (2015). Bayesian integration of skewed distributions during sensorimotor learning. *Society for Neuroscience*, Chicago, IL.
11. **McGregor HR**, Cashaback JGA, Gribble PL (2015). Neuroplasticity in primary somatosensory cortex supports motor learning by observing. *Society for Neuroscience*, Chicago, IL.
10. **McGregor HR**, Cashaback JGA, Gribble PL (2015). The somatosensory system supports motor learning by observing. *The Brain and Mind Symposium*, London, ON.
9. Pun H, Cashaback JGA, **McGregor HR**, Gribble PL (2015). Motor prediction and object lifting. *Southern Ontario Neuroscience Association*, Hamilton, ON.
8. **McGregor HR**, Gribble PL (2015). Resting-state functional connectivity predicts observational motor learning. *Society for the Neural Control of Movement*, Charleston, SC.
7. Kistemaker D, Cashaback JGA, **McGregor HR**, Gribble PL (2015). On what basis does the brain select muscle activation patterns. *Society for the Neural Control of Movement*, Charleston, SC.
6. Cashaback JGA, **McGregor HR**, Gribble PL (2014). The human motor system adapts reaching movements for both task-relevant and task-irrelevant forces. *Society for Neuroscience*, Washington, USA.
5. **McGregor HR**, Gribble PL (2013). Brain networks underlying observational motor learning. *Society for Neuroscience*, San Diego, CA.
4. **McGregor HR**, Gribble PL. (2013). Brain networks underlying motor learning by observing assessed using resting-state fMRI. *Progress in Motor Control meeting*, Montreal, QC.
3. **McGregor HR**, Gribble PL (2013). Exploring the Neural Basis of Observational Motor Learning using Resting-state fMRI. *Organization for Human Brain Mapping*, Seattle, WA.
2. **McGregor HR**, Gribble PL (2013). Motor learning by observing: A resting-state fMRI study. *Society for the Neural Control of Movement*, San Juan, Puerto Rico.

1. **McGregor HR**, Gribble PL (2012). Mapping functional changes in resting-state sensorimotor networks following active and observational learning using fMRI. *Society for Neuroscience*, New Orleans, LA.

## Book Chapters

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1. **McGregor HR**, Gribble PL (2016). Observational Motor Learning. In SS Obhi & ES Cross (eds.). *Shared Representations: Sensorimotor Foundations of Social Life (Social Neuroscience Series)*. Cambridge University Press, 525-540

## Skills

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### TOOLS & TECHNIQUES

Resting-state fMRI | Voxel-based Morphometry | Diffusion-weighted MRI | Task-based fMRI  
Electroencephalography (EEG) | Event-related Potentials (ERPs) | Peripheral Nerve Stimulation  
Single-pulse Transcranial Magnetic Stimulation (TMS) | Somatosensory Evoked Potentials (SEPs)  
Motor Evoked Potentials (MEPs) | Electromyography (EMG) [familiar] | Motion Capture [familiar]

### PARADIGMS

Motor Learning & Adaption | Inter-limb transfer | Kinematic Analysis | Proprioceptive Testing  
Perceptual Training | Cognitive Testing (Paced Auditory Serial Addition Test, N-back Test)

### NEUROIMAGING TOOLS

FSL | CONN | SPM12 | Advanced Normalization Tools (ANTs) | AFNI [familiar]

### SOFTWARE

SPSS | Brain Vision | Brainsight TMS Neuronavigation | Signal | LaTeX  
Microsoft Office Suite (Word, Excel, PowerPoint) | Adobe Creative Suite (Illustrator, Photoshop)

### PROGRAMMING

MATLAB | Unix shell scripting | Python [familiar] | R [familiar] | C++ [learning]

## Professional Training

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### Electroencephalography (EEG) Workshop

THE UNIVERSITY OF WESTERN ONTARIO

*London, ON*

2016

### Representational Similarity Analysis (RSA) Workshop

MRC COGNITION AND BRAIN SCIENCES UNIT, UNIVERSITY OF CAMBRIDGE

*Cambridge, UK*

2015

### Analysis of Functional NeuroImages (AFNI) Bootcamp

NATIONAL INSTITUTES OF HEALTH

*Bethesda, MD*

2013

### FMRI Software Library (FSL) Course

UNIVERSITY OF BRISTOL

*Bristol, UK*

2012

## Teaching Experience

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### UNDERGRADUATE LEVEL

2013–14 **Teaching Assistant & Tutorial Instructor**, Research Methods and Statistical Analysis in Psychology, The University of Western Ontario *PSYCH 2820E*

## Mentorship

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### POSTDOCTORAL ASSOCIATES

2019– Ana Salazar, Postdoctoral associate, University of Florida

### GRADUATE STUDENTS

2018– Kathleen Hupfeld, PhD candidate, University of Florida

2019– Grant Tays, PhD student, University of Florida

2018–19 Lauren Banker, MSc student, University of Florida

### UNDERGRADUATE STUDENTS

2016–17 Seth Kibel, BSc student, The University of Western Ontario

2015–16 Cricia Rinchon, BSc student, The University of Western Ontario

2014–15 Anthony Wong, BSc student, The University of Western Ontario

2013–14 Meghan Bhatia, BSc student, The University of Western Ontario

2012–13 Dan Huynh, BSc student, The University of Western Ontario

## Contributions

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### PROFESSIONAL SOCIETIES

Society for Neural Control of Movement (Elected as Trainee Board Member in 2020)

Society for Neuroscience

Organization for Human Brain Mapping

Vision Sciences Society

Canadian Association for Neuroscience

Canadian Society for Brain, Behaviour & Cognitive Science

### COMMUNITY SERVICE & OUTREACH

2021 Judge, JSEHS STEM Poster Competition, University of Florida

2019–20 Volunteer, Girls With Nerve Camp, University of Florida

2019 Volunteer, National Biomechanics Day, University of Florida

2016–17 Volunteer, London Brain Bee, University of Western Ontario

2014–16 Lead organizer, London Brain Bee, University of Western Ontario

2013–14 Volunteer, London Brain Bee, University of Western Ontario