CORSON N. ARESHENKOFF

🌐 Webpage

⬡ Github

G Google scholar profile

✉ areshenk@protonmail.com

INTERESTS

Broadly, I am interested in the development and use cognitive strategies during task performance. I am especially interested in the relationship between individual differences in executive functions and related brain-circuitry, and individual differences in the ability to learn and take strategic advantage of the structure of a task. My research focuses largely on the role of explicit processes in sensorimotor learning and control, and ways in which subjects' conscious awareness of a task structure leads to more efficient learning of novel motor skills.

SKILLS

Languages: R, Python, Stan

Techniques: fMRI experimental design and data analysis; meta-analysis; latent-variable and factor modeling.

EDUCATION

2017 - 2023

PhD, Cognitive Neuroscience — Queen's University

Thesis: Taking the "motor" out of motor learning: Cognitive brain networks and explicit processes in sensorimotor learning and control.

Advisor: Dr. Jason Gallivan

A series of functional MRI experiments investigating changes in cognitive network structure during motor learning. The experiments focused specifically on networks supporting explicit strategy use in subjects reporting conscious knowledge of the task structure. The results link individual differences in strategic performance to interactions between medial temporal structures and regions of the default-mode network.

2015 - 2016

MSc, Psychology — University of Victoria

Thesis: Task-dependent motor representations evoked by spatial words

Advisor: Dr. Daniel Bub

A series of motion tracking experiments investigating the conditions under which spatial prime words affect the kinematics of a planned directional reach action.

2012 - 2015

BSc, Mathematics — University of Victoria

PUBLICATIONS

Submitted or under review:

Areshenkoff, C.N., de Brouwer, A. J., Gale, D. J., Standage, D., Nashed, J. Y., Randall Flanagan, J., and Gallivan, J. P. (2024c). Individual variability in sensorimotor learning reflects trait-like neurobehavioral subject factors. *bioRxiv*, pages 2024–04

Preprint: https://www.biorxiv.org/content/10.1101/2024.04.11.589135.abstract

Peer reviewed publications:

Areshenkoff, C.N., de Brouwer, A. J., Gale, D. J., Nashed, J. Y., Smallwood, J., Flanagan, J. R., and Gallivan, J. P. (2024b). Distinct patterns of connectivity with the motor cortex reflect different components of sensorimotor learning. *PLoS biology*, 22(12):e3002934

Nick, Q., Gale, D. J., **Areshenkoff, C.N.**, De Brouwer, A., Nashed, J., Wammes, J., Zhu, T., Flanagan, R., Smallwood, J., and Gallivan, J. (2024). Reconfigurations of cortical manifold structure during reward-based motor learning. *Elife*, pages 2023–07

Brien, D. C., Riek, H. C., Yep, R., Huang, J., Coe, B., **Areshenkoff, C.N.**, Grimes, D., Jog, M., Lang, A., Marras, C., et al. (2023). Classification and staging of parkinson's disease using video-based eye tracking. *Parkinsonism & Related Disorders*, page 105316

Standage, D. I., **Areshenkoff, C.N.**, Gale, D. J., Nashed, J. Y., Flanagan, J. R., and Gallivan, J. P. (2023). Whole-brain dynamics of human sensorimotor adaptation. *Cerebral Cortex*, 33(8):4761–4778

Gale, D. J., **Areshenkoff, C.N.**, Standage, D. I., Nashed, J. Y., Markello, R. D., Flanagan, J. R., Smallwood, J., and Gallivan, J. P. (2022). Distinct patterns of cortical manifold expansion and contraction underlie human sensorimotor adaptation. *Proceedings of the National Academy of Sciences*, 119(52):e2209960119

Areshenkoff, C.N., Gale, D. J., Standage, D., Nashed, J. Y., Flanagan, J. R., and Gallivan, J. P. (2022). Neural excursions from manifold structure explain patterns of learning during human sensorimotor adaptation. *Elife*, 11:e74591

de Brouwer, A. J., **Areshenkoff, C.N.**, Rashid, M. R., Flanagan, J. R., Poppenk, J., and Gallivan, J. P. (2021). Human variation in error-based and reinforcement motor learning is associated with entorhinal volume. *Cerebral Cortex*

Areshenkoff, C.N., Nashed, J. Y., Hutchison, R. M., Hutchison, M., Levy, R., Cook, D. J., Menon, R. S., Everling, S., and Gallivan, J. P. (2021b). Muting, not fragmentation, of functional brain networks under general anesthesia. *Neuroimage*

Gale, D. J., **Areshenkoff, C.N.**, Honda, C., Johnsrude, I. S., Flanagan, J. R., and Gallivan, J. P. (2021). Motor planning modulates neural activity patterns in early human auditory cortex. *Cerebral Cortex*

Standage, D., **Areshenkoff, C.N.**, Nashed, J. Y., Hutchison, R. M., Hutchison, M., Heinke, D., Menon, R. S., Everling, S., and Gallivan, J. P. (2020). Dynamic reconfiguration, fragmentation and integration of whole-brain modular structure across depths of unconsciousness. *Cerebral Cortex*

Karr, J. E., **Areshenkoff, C.N.**, Rast, P., Hofer, S. M., Iverson, G. L., and Garcia-Barrera, M. A. (2018). The unity and diversity of executive functions: A systematic review and re-analysis of latent variable studies. *Psychological bulletin*, 144(11):1147

Trafimow, D., Amrhein, V., **Areshenkoff, C.N.**, Barrera-Causil, C. J., Beh, E. J., Bilgiç, Y. K., Bono, R., Bradley, M. T., Briggs, W. M., Cepeda-Freyre, H. A., et al. (2018). Manipulating the alpha level cannot cure significance testing. *Frontiers in Psychology*, 9:699

Areshenkoff, C.N., Bub, D. N., and Masson, M. E. (2017). Task-dependent motor representations evoked by spatial words: Implications for embodied accounts of word meaning. *Journal of Memory and Language*, 92:158–169

Smart, C. M., Karr, J. E., **Areshenkoff, C.N.**, Rabin, L. A., Hudon, C., Gates, N., Ali, J. I., Arenaza-Urquijo, E. M., Buckley, R. F., Chetelat, G., et al. (2017). Non-pharmacologic interventions for older adults with subjective cognitive decline: systematic review, meta-analysis, and preliminary recommendations. *Neuropsychology review*, 27(3):245–257

Karr, J. E., Garcia-Barrera, M. A., and **Areshenkoff, C.N.** (2014a). Executive functions and intraindividual variability following concussion. *Journal of clinical and experimental neuropsychology*, 36(1):15–31

Karr, J. E., **Areshenkoff, C.N.**, Duggan, E. C., and Garcia-Barrera, M. A. (2014b). Blast-related mild traumatic brain injury: a bayesian random-effects meta-analysis on the cognitive outcomes of concussion among military personnel. *Neuropsychology review*, 24(4):428–444

Karr, J. E., **Areshenkoff, C.N.**, and Garcia-Barrera, M. A. (2014c). The neuropsychological outcomes of concussion: A systematic review of meta-analyses on the cognitive sequelae of mild traumatic brain injury. *Neuropsychology*, 28(3):321

Karr, J. E., **Areshenkoff, C.N.**, Rast, P., and Garcia-Barrera, M. A. (2014d). An empirical comparison of the therapeutic benefits of physical exercise and cognitive training on the executive functions of older adults: A meta-analysis of controlled trials. *Neuropsychology*, 28(6):829

Presentations:

Areshenkoff, C.N., de Brouwer, A. J., Gale, D. J., Nashed, J. Y., Flanagan, J. R., and Gallivan, J. P. (2024a). Prefrontal-hippocampal interactions support rapid behavioural adjustments during motor learning. Poster presented at the annual meeting for the Society for Neuroscience, Chicago, IL

Areshenkoff, C.N., de Brouwer, A. J., Gale, D. J., Nashed, J. Y., Flanagan, J. R., and Gallivan, J. P. (2023). The structural-functional neural architectures of implicit and explicit motor learning. Poster presented at the annual meeting for the Society for Neuroscience, Washington, DC

Areshenkoff, C.N., Gale, D. J., Nashed, J. Y., Standage, D., Flanagan, J. R., and Gallivan, J. P. (2021a). Neural excursions from low-dimensional manifold structure in cognitive and sensorimotor brain networks explains intersubject variation in human motor learning. Paper presented at the annual meeting for the Society for the Neural Control of Movement

Areshenkoff, C.N., Nashed, J. Y., Hutchison, R. M., Hutchison, M., Menon, R. S., Everling, S., and Gallivan, J. P. (2020). Predicting depth of sedation from latent structure in whole-brain cortical networks. Paper presented at the annual meeting for the Organization for Human Brain Mapping

Areshenkoff, C.N., de Brouwer, A., Nashed, J. Y., Gale, D., and Gallivan, J. P. (2019). Network-level interactions during sensorimotor adaptation learning and generalization. Poster presented at the annual meeting for the Society for Neuroscience, San Diego, CA

Areshenkoff, C.N., Nashed, J. Y., Standage, D., and Gallivan, J. P. (2018). Functional coupling between the basal ganglia and cerebellum during visuomotor adaptation learning. Poster presented at the annual meeting for the Society for Neuroscience, San Diego, CA

Standage, D., Nashed, J. Y., **Areshenkoff, C.N.**, Flanagan, R. J., and Gallivan, J. P. (2018). Whole-brain modular structure of spontaneous neural activity at rest predicts future sensori-motor learning. Poster presented at the annual meeting for the Society for Neuroscience, San Diego, CA

Areshenkoff, C.N., Bub, D. N., and Masson, M. E. (2016). Parallel encoding of alternative action possibilities alters the execution of a cued action. Poster presented at the 31st meeting of the Society for the Neuroscience of Decision Making. Montreal, QC

Areshenkoff, C.N. and Bub, D. N. (2016). The temporal dynamics of motor affordances. Poster presented at the 31st meeting of the Society for the Neuroscience of Decision Making. Montreal, QC

Mulligan, B. P., **Areshenkoff, C.N.**, and Smart, C. M. (2015). Eeg entropy predicts intensively measured cognitive performance in healthy older adults. In *Psychophysiology*, volume 52, pages S25–S25. WILEY-BLACKWELL 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

Areshenkoff, C.N., Bub, D. N., and Masson, M. E. (2015). Embodied representation of word meaning. In *Canadian Journal of Experimental Psychology-Revue Canadienne de Psychologie Experimentale*, volume 69, pages 343–343. Canadian Psychological Assoc. 141 Laurier Ave West, STE 702, Ottawa, Ontario

Areshenkoff, C.N., Karr, J. E., and Garcia-Barrera, M. (2013b). Performance patterns of card selection in the iowa gambling task: Preliminary evidence of high sensitivity to losses following mtbi [abstract]. In *Journal of the International Neuropsychological Society*, volume 19, page 75

Areshenkoff, C.N., Karr, J. E., Crevier-Quintin, E., and Garcia-Barrera, M. (2013a). The benefits of physical and cognitive training programs of executive functions among older adults: A meta-analytical comparison. Poster presented at the 41st annual meeting of the International Neuropsychological Society. Waikaloa, Hawaii

Karr, J. E., **Areshenkoff, C.N.**, Evans, J., Jewett, David Nguyen, K., Tutt, G., and Garcia-Barrera, M. (2012). Physical exercise versus cognitive training on executive functioning: It's a tie! a meta-analysis of controlled trials during healthy aging. Lecture presented at the annual meeting of the Canadian Association of Gerontology. Vancouver, BC

Grindstaff, T. R., Karr, J. E., **Areshenkoff, C.N.**, Saville, K., Alexander, J., and Alexander, R. (2012). Frontal and parietal differences in p300 amplitude and latency during a self-evaluation task. Poster presented at the 24th annual convention of the Association for Psychological Science. Chicago, Illinois

AWARDS AND FUNDING

$84,000	**NSERC PGS-D Graduate Scholarship**	**2017-2020**
$5,000	**Queens graduate entrance award**	**2017**
$2,000	**UVic graduate award**	**2016**
$1,000	**UVic graduate award**	**2015**

PROJECTS

Software   **spdm**   **Documentation**
spdm is an R package designed for the geometry-respecting manipulation and analysis of covariance matrices – that is, methods which respect the natural Riemannian-manifold structure of the space of symmetric, positive-definite matrices. The package is domain agnostic, but is particularly well suited to the analysis of fMRI functional connectivity.

Software   **iowa**   **Documentation**
iowa is an R package implementing highly modular reinforcement learning models of the Iowa gambling task. It allows models to be built by piecing together various common utility, updating, and choice temperature functions; and these models can then be used to simulate performance in the task, or can be fit to subject data either by maximum likelihood, or full posterior sampling using cmdstan as a back-end.

Software   **MSMVSampEn**   **Documentation**
MSMVSampEn is an R package for computing multiscale, multivariate sample entropy of biological signals.

TEACHING

Course	**Queens University – Psyc 801: Design of Experiments** Teaching assistant. Prepared lecture materials, assignments, and labs.	**2020-2022**
Course	**Queens University – Psyc 376: Functional Neuroimaging of the Human Brain and Mind** Teaching assistant.	**2017-2019**
Course	**Queens University – Psyc 370: Brain and Behavior II** Teaching assistant.	**2017**
Workshop	**University of Victoria – Bayesian statistics tutorial** Tutorial and workshop on Bayesian statistics using R and Stan. Attended by students and faculty.	**2016**
Course	**University of Victoria – Psyc 401: Measurement of Psychological Processes** Guest lecture on exploratory factor analysis and principal component analysis.	**2016**
Course	**University of Victoria – Psyc 401: Measurement of Psychological Processes** Teaching assistant and guest lecturer on exploratory factor analysis, validity, and generalizability theory.	**2015**

Course	**University of Victoria – Psyc 351C: Introduction to Mind and Brain**	**2015**
	Teaching assistant and guest lecturer on reinforcement learning and the basal ganglia.	
Workshop	**University of Victoria – Summer statistics and programming tutorial**	**2013**
	Organized and led a series of weekly tutorials on statistics and programming in MATLAB.	

FURTHER ACADEMICS

Summer school	**Vector institute deep learning and reinforcement learning summer school**	**2018**
	University of Toronto, ON, Canada	
Summer school	**Computational sensorimotor neuroscience (CoSMo) summer schools**	**2017**
	University of Minnesota, Minneapolis, MN, USA	
Summer school	**Temporal Dynamics of Learning Center (TDLC) Summer School**	**2015**
	University of San Diego, CA, USA	