Harrison Ritz

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Academic Appointments

2022 - Present **Princeton University** — *Princeton Neuroscience Institute*
C.V. Starr Fellow
Advisors: Drs. Jonathan D. Cohen & Nathaniel D. Daw

Education

2016 – 2022 **Brown University** — *Dept. of Cognitive, Linguistic & Psychological Sciences*
Ph.D. in Psychology
Advisors: Drs. Amitai Shenhav & Michael J. Frank

2014 – 2016 **University of Western Ontario** — *Brain and Mind Institute*
M.Sc. in Psychology (Cognitive and Behavioral Neuroscience Specialization)
Advisor: Dr. Ingrid Johnsrude

2010 – 2014 **Queen's University** — *Dept. of Psychology*
B.Sc. in Psychology (Honors, Distinction)
Honors Thesis Advisor: Dr. Ingrid Johnsrude

Awards and Fellowships

2022 – present *C.V. Starr Postdoctoral Fellowship*, Princeton University (Salary & Research Funds)
2019 – 2020 *Carney Graduate Award in Brain Science*, Brown University (Salary & Research Funds)
2019 *Cognitive Science Society Travel Award*
2018 – 2019 *Eimas Graduate Research Award*, Brown University (Research Funds)
2014 *Certificate of Academic Excellence,* Canadian Psychological Association (Thesis Award)
2011 *Summer Work Experience Program*, Queen's University
2010 – 2014 *Dean's Honor List*, Queen's University
2010 – 2014 *Foresters Competitive Scholarship*
2010 *Queen's University Excellence Scholarship*

Preprint Manuscripts [* shared authorship; # trainee]

Ritz, H., Jha, A., Daw, N.D., & Cohen, J.D. Humans actively reconfigure neural task states. Preprint: doi.org/10.1101/2024.09.29.615736

Ritz, H.*, Frömer, R.*, & Shenhav, A. Phantom controllers: Misspecified models create the false appearance of adaptive control during value-based choice. Preprint: doi.org/10.1101/2023.01.18.524640

Peer-Reviewed Publications [* shared authorship; # trainee]

Ritz, H., & Shenhav, A. (2024). Orthogonal neural encoding of targets and distractors supports multivariate cognitive control. *Nature Human Behaviour*, *8*, 945–961.
Open Dataset: https://doi.org/10.18112/OPENNEURO.DS004909.V1.1.0

Ritz, H., & Shenhav, A. (2023). Humans reconfigure target and distractor processing to address distinct task demands. *Psychological Review, 131(2),* 349–372.
Open Dataset: http://dx.doi.org/10.6084/m9.figshare.16755418.v1

Rier, L., Michelmann, S., **Ritz, H.**, Shah, V., Hill, R.M., Osborne, J., Doyle, C., Holmes, N., Bowtell, R., Brookes, M.J., Norman, K.A., Hasson, U., Cohen, J.D., Boto, E. (2023). Test-Retest Reliability of the Human Connectome: An OPM-MEG study. *Imaging Neuroscience.*
Open Dataset: https://doi.org/10.5281/zenodo.7525341

Ritz, H., Wild, C.J., & Johnsrude, I.J. (2022). Parametric Cognitive Load Reveals Hidden Costs in the Neural Processing of Perfectly Intelligible Degraded Speech. *Journal of Neuroscience 42(23)*, 4619–4628.

Rmus, M.[#], **Ritz, H.**, Hunter, L.E., Bornstein, A.M., & Shenhav, A. (2022). Humans can navigate complex graph structures acquired during latent learning. *Cognition*, *225*, 105103.

Ritz, H., Leng, X., & Shenhav, A. (2022). Cognitive Control as a Multivariate Optimization Problem. *Journal of Cognitive Neuroscience*, 1–23.

Leng, X., Yee, D., **Ritz, H.**, & Shenhav, A. (2021). Dissociable influences of reward and punishment on adaptive cognitive control. *PLoS Computational Biology*, *17*(12), e1009737.

Ritz, H., Frömer, R., & Shenhav, A. (2020). Bridging motor and cognitive control: It's about time! (Spotlight). *Trends in Cognitive Sciences*. *24*(1), 6–8.

Nassar, M.R., McGuire, J.T., **Ritz, H.**, & Kable, J. (2019). Dissociable forms of uncertainty-driven representational change across the human brain. *Journal of Neuroscience*, 39(9), 1688-1698.

Ritz, H., Nassar, M.R., Frank, M.J., & Shenhav, A. (2018). A control theoretic model of adaptive behavior in dynamic environments. *Journal of Cognitive Neuroscience, 30(10),* 1405-1421.

Peer-Reviewed Conference Proceedings [* shared authorship; # trainee]

Geadah, V., Arbelaiz, J., **Ritz, H.**, Daw, N., Cohen, J.D., Pillow J. (2024). Inferring System and Optimal Control Parameters of Closed-Loop Systems from Partial Observations*. IEEE Decision and Control.* [8 pg., **Talk**]

Ritz, H., Jha, A., Pillow, J., Daw, N., & Cohen J.D. (2024). Dynamic neural control of task representations in humans and neural networks. *Cognitive Computational Neuroscience*. [2 pg., Poster].

Ritz, H., Jha, A., Pillow, J., & Cohen J.D. (2023). Task preparation is reflected in neural state space dynamics. *Cognitive Computational Neuroscience*. [2 pg., Poster].

Ritz, H., Wolf, W., & Cohen J.D. (2023). Continuous and Discrete Transitions during Task-Switching. *Cognitive Science Society*. [4 pg., Poster].

Ritz, H. & Shenhav, A. (2022). Orthogonal neural encoding of targets and distractors supports cognitive control. *Cognitive Computational Neuroscience*. [2 pg., Poster].

Ritz, H., DeGutis, J., Frank M.J., Esterman, M., & Shenhav, A. (2020). An evidence accumulation model of motivational and developmental influences over sustained attention. *Cognitive Science Society.* [4 pg., Poster].

Leng, X., **Ritz, H.**, Yee, D., & Shenhav, A. (2020). Dissociable influences of reward and punishment on adaptive cognitive control. *Cognitive Science Society.* [4 pg., Poster]

Ritz, H. & Shenhav, A. (2019). Parametric control of distractor-oriented attention. *Cognitive Science Society.* [4 pg., **Talk**].

Ritz, H., Nassar, M.R., Frank, M.J., & Shenhav, A. (2019). Decisions about reward and effort for the learning and control of dynamical systems. *Reinforcement Learning and Decision Making* [4 pg., Poster].

Ritz, H., Nassar, M.R., Frank, M.J., & Shenhav, A. (2017). Behavioral evidence for PID-like feedback control. *Reinforcement Learning and Decision Making.* [4 pg., **Poster Spotlight Talk**].

Contributions to Open-Source Software

2025	Pull requests improving OPM compatibility in MNE (2) and MNE-BIDS-Pipeline (5)
2024	*StateSpaceAnalysis.jl*. Zenodo: https://doi.org/10.5281/ZENODO.14511206. Julia General Registry uuid: 8767b432-2e83-436f-aa62-e8e2db78ab85

Chaired Conference Symposia and Workshops

Nov. 2022	*Cortical Basis of Cognitive Control Across Species (*Nanosymposium Chair*).* Society for Neuroscience. San Diego, USA.

Invited Seminar Talks

June 2025	*Weekly Colloquium*. Vrije Universiteit Amsterdam. Amsterdam, NL.
Nov. 2024	*Cognitive Control Seminar*, University of Iowa. Iowa City, USA.
Nov. 2024	*CRAM Seminar*, McGill University. Montreal, CA.
Apr. 2024	*Cog Neuro Seminar*, Yale University. New Haven, USA.
Dec. 2023	*ConCat Series*, New York University. New York, USA.
Nov. 2023	Dept. of Psychology, University of British Columbia. Vancouver, CA.
Oct. 2022	Rotman Research Institute in Baycrest Hospital. Toronto, CA.
June 2022	*BLRB Group*, University of Chicago.
Oct. 2021	*Ghent Effort Group*, Ghent University.
Feb. 2020	*ConCat Series*, New York University. New York, USA.
May 2018	*CBC Series*, Universitat Pompeu Fabra. Barcelona, ES.

Invited Laboratory Talks

May. 2025	*Duncker Lab*, Columbia University.
Nov. 2023	*Cole Lab*, Rutgers University.

Feb. 2022	*Woolgar Lab*, University of Cambridge.
Feb. 2022, Apr. 2023	*Egner Lab*, Duke University.
Nov. 2021	*Otto Lab*, McGill University.
July 2021	*Mars Lab*, University of Oxford.
June 2021	*CoCoA Lab (Dr. Taraz Lee)*, University of Michigan.
May 2021	*Verguts Lab*, Ghent University.
Apr. 2021	*Western Sensorimotor SuperLab*, Western University.
Feb. 2021, Sept. 2022	*Summerfield Lab*, University of Oxford.
Nov. 2020	*Jazayeri Lab*, Massachusetts Institute of Technology.
Oct. 2020	*Schultz Lab*, Max Planck Institute for Biological Cybernetics.
Sept. 2020	*Kool Lab*, University of Washington in St. Louis.
Aug. 2020	*Collins Lab*, University of California Berkeley.
May 2020	*McGuire Lab*, Boston University.
Apr. 2020	*Hayden Lab*, University of Minnesota.
Mar. 2020	*Donner Lab*, Hamburg University.

Conference Presentations [# trainee; excluding proceedings listed above]

Ritz, H., Jha, A., Pillow, J., & Cohen J.D. Task preparation is reflected in neural state space dynamics.
- *Canadian Association of Neuroscience* (2025). Toronto, CA. [Poster]
- *Canadian Society for Brain, Behavior, and Cognitive Science* (2024). Edmonton, CA. [**Talk**]
- *Cognitive Neuroscience Society* (2024). Toronto, CA. [Poster]
- *The New VISTAs in Vision Research* (2023). Toronto, CA. [Poster]
- *Motivational and Cognitive Control* (2023). Lyon, FR. [Poster]

Geadah, V., Arbelaiz, J., **Ritz, H.**, Daw, N., Cohen, J.D., Pillow J. Inferring System and Optimal Control Parameters of Closed-Loop Systems from Partial Observations.
- *Cosyne* (2025). Montreal, CA. [Workshop Talk by V.G.]
- *IEEE Conference on Decision and Control* (2024). Milan, IT. [Contributed Talk by V.G.]

Pulido, J.[#], **Ritz, H.**, Wolf, W., Cohen, J.D. Investigating the Dynamics of Task Switching.
- *Society for Neuroscience (2023).* Washington, USA. [Poster by J.P.]
- *Princeton Neuroscience Institute Poster Day* (2023). Princeton, USA. [Poster by J.P.]
- *Leadership Alliance National Symposium* (2023). Hartford, USA. [Talk by J.P.]

Ritz, H. & Shenhav, A. Orthogonal neural encoding of targets and distractors supports cognitive control.
- *Motivational and Cognitive Control* (2023). Lyon, FR. [**Talk**]
- *Canadian Society for Brain, Behavior, and Cognitive Science (2023)*. Guelph, CA. [**Talk**]
- *Society for Neuroscience* (2023). Washington, USA. [**Nanosymposium Talk**]
- *Workshop on Mental Effort* (2022). Providence, USA. [Poster]

Ritz, H., Frömer, R. & Shenhav, A. Disentangling stimulus-driven and controlled processes during value-based decision making.
- *Society for Neuroscience* (2021). Online. [Poster]

- *Society for Neuroeconomics* (2021). Online. [Poster]

Vartany S., Allawala A., **Ritz, H.**, Adkinson J. Mathura R., Bijanki K., Shenhav A., Goodman W., Pouratian N., Sheth S., Borton D. Deep Brain Stimulation in Treatment-Resistant Depression Modulates Oscillations Above 1/f Spectral Noise in Cognitive Control Networks.
- Neuromatch Conference 4.0 (2021). Online. [Talk by V.S.]

Ritz, H., Hayden, B., Shenhav, A., Yoo, S.B., Optimal control of approach-avoidance dynamics.
- *Neuromatch 3.0* (2020). Online. [**Talk**]

Ritz, H., Nassar, M.R., Frank, M.J., & Shenhav, A., Optimal decision-making in metric space.
- *Society for Neuroeconomics* (2020). Online. [**Poster Spotlight Talk**]

Ritz, H., & Shenhav, A. Humans reconfigure target and distractor processing to address distinct task demands
- *Workshop on Mental Effort* (2021). Online. [Poster]
- *Motivational and Cognitive Control* (2019). Berlin, DE. [Poster]
- *Control Processes* (2019). Providence, USA. [Poster]
- *Cognitive Neuroscience Society* (2018). Boston, USA. [Poster]

Rmus, M.[#], **Ritz, H.**, Hunter, L., Bornstein, A., & Shenhav. A. Humans can navigate complex graph structures acquired during latent learning.
- *Reinforcement Learning and Decision Making* (2019). Montreal, CA. [**Workshop Talk by H.R.**]
- *Society for Neuroeconomics* (2018). Philadelphia, USA. [Talk by M.R.]

Ritz, H., DeGutis, J., Frank M.J., Esterman, M., & Shenhav, A. Modeling motivational influences on sustained attention.
- *Winter Conference on Brain Research* (2019). Snowmass, USA. [Poster]
- *Society for Neuroeconomics* (2018). Philadelphia, USA. [Poster]

Ritz, H., Dean Wolf, C., Frömer, R., & Shenhav, A. Quantifying the demands of value-based decision-making with short-term memory interference.
- *Cognitive Neuroscience Society* (2019). San Francisco, USA. [Poster]

Ritz, H., Nassar, M.R., Frank, M.J., & Shenhav, A. Behavioral evidence for PID-like feedback control.
- *Society for Neuroscience* (2017). Washington, USA. [**Nanosymposium Talk**]
- *New England Research in Decision-Making* (2017). Providence, USA. [**Talk**]
- *Brown Mind Brain Research Day* (2017). Providence, USA. [Poster]

Ritz, H., Wild, C., & Johnsrude, I.J. The effects of concurrent cognitive load on the processing of clear and degraded speech.
- *Organization for Human Brain Mapping* (2016). Geneva, CH. [Poster]

Ritz, H., Arbuckle, S., Wild, C., & Johnsrude, I.J. Enhanced recognition memory for acoustically degraded sentences.
- *Association for Research in Otolaryngology* (2015). San Diego, USA. [Talk by I.J.]
- *Brain and Mind Institute Symposium* (2015). London, CA. [Poster]

Ritz, H. & Johnsrude, I.J. Attention enhances phase-locking in the frequency following response.
- *Canadian Society of Brain, Behaviour, and Cognitive Science.* (2014). Toronto, CA. [Poster]
- *McMaster University NeuroXchange Conference* (2014). Hamilton, CA. [Poster]

Research Courses

Summer 2019	*Kavli Summer Institute in Cognitive Neuroscience*, Santa Barbara, USA.
Summer 2017	*Methods in Neuroscience at Dartmouth*, Hanover, USA.

Teaching

Spring 2019	*fMRI: Theory and Practice*, Brown University, TA - Assisted students with coding, collecting, and analyzing an fMRI experiment
Spring 2018	*Cognitive Neuropsychology*, Brown University, TA
Fall 2017	*Social Psychology*, Brown University, TA
2015 – 2016	*Statistics using Computers (full year)*, Western University, TA - Ran two lab sections per week on using SPSS for statistical analysis.
2014 – 2015	*Sensation and Perception (full year)*, Western University, TA
2012 – 2013	*Introduction to Psychology (full year)*, Queen's University, TA - Combined with a seminar on educational psychology

Mentorship

2024	Haley Champion, undergraduate RA (ReMatch+ mentorship program)
2024	Jenna Mullin, summer intern (OURSIP mentorship program)
2022 – Present	William Wolf, staff RA
2023	Joemari Pulido, summer intern (PNI Summer Internship Program)
2021	Kyle Chen, undergraduate RA
2019 – 2022	Christopher Bravo, undergraduate RA
2019 – 2020	Jennifer Dzul, honors thesis: *Are Distractors really that Distracting? A Closer Look into Target vs Distractor Sensitivity in Older Adults*
2019 – 2020	Natalie Knowles, undergraduate RA
2019	Savannah Doelfel, undergraduate RA
2017 – 2019	Allison Loynd, undergraduate RA
2017 – 2018	Milena Rmus, honors thesis: *Model-based decision-making is associated with structure inference ability*
2017	William McNelis, undergraduate RA
2016 – 2017	Kia Sadahiro, undergraduate RA
2015 – 2016	Jessica Uthayakumar, honors thesis: *Consequences of acoustic degradation and semantic context on recognition memory*

Service Positions

2022 - Present	*PNI Climate and Inclusion Committee*, Princeton University
2025	*Junior Thesis Moderator*, Princeton University
2024 - 2025	*PNI Colloquium Committee*, Princeton University

2024	*ReMatch+ Summer Internship Mentor,* Princeton University
2023	*PNI Summer Internship Mentor*, Leadership Alliance & Princeton University
2021	*FYRE Teaching Assistant*, Leadership Alliance & Brown University
2020 – 2021	*Departmental Colloquium Committee*, Brown University
2018 – 2019	*Cognition Seminar Series Organiser*, Brown University
2017 – 2018	*Psychology Graduate Student Representative*, Brown University
2017 – 2022	*Optimism Walk Participant*, American Parkinson Disease Association
2017 – 2020	*Brown Brain Week Participant*, Brown University
2015 – 2016	*Psychology Graduate Student Representative*, Western University
2015 – 2016	*Psychology Colloquium Committee*, Western University
2013 – 2014	*Psychology Undergraduate Student Council*, Queen's University

Popular Media

Nov 2024 — Bielski, Z. (2024, November 20). *Instead of fighting back against our many distractions, these experts say we're better off accepting them.* The Globe and Mail. https://www.theglobeandmail.com/canada/article-digital-distraction-focus-experts/

- Interviewed on QR Calgary 770AM

March 2024 — Schrafft, G. (2024, March 8). *Lack of focus doesn't equal lack of intelligence — it's proof of an intricate brain*. News from Brown. https://www.brown.edu/news/2024-03-08/focus

- Picked up by 32 news outlets (Altmetric)
- Interview on KCBS Radio in San Francisco

Pre-Graduate Research Experience

2013 – 2014	Queen's University. Advisor: Dr. Ingrid Johnsrude
2011 – 2012	Queen's University. Advisor: Dr. Monica Castelhano
Summer 2010	Juravinski Cancer Centre. Advisor: Dr. Jehonathan Pinthus

Ad Hoc Reviewer

eLife; Nature Human Behaviour; Nature Communications; Trends in Cognitive Science; Journal of Experimental Psychology (General, HPP); Journal of Neuroscience; Imaging Neuroscience; Neuroimage; Journal of Cognitive Neuroscience; Computational Brain & Behavior; Cognitive, Affective, & Behavioral Neuroscience; Acta Psychologica; Wiley Interdisciplinary Reviews: Cognitive Science

Technical Skills

Programming	MATLAB, Julia, Python, R; Git, high-performance computing (SLURM, Bash scripting)
Neuroimaging	SPM, fMRIprep, FSL; MNE, EEGLab; Pytorch; Psychophysics toolbox, PsychoPy, jsPsych
Data Collection	fMRI operator (Brown University), OPM-MEG operator (Princeton University)