

## Academic Appointments

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

## Accolades & Funding

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  
(two per year for top psychology honors thesis at Queen's University)

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*

## Manuscripts Under Review or In Revision [\* shared authorship; # trainee]

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

- Ritz, H.**, & Shenhav, A. (2023). Humans reconfigure target and distractor processing to address distinct task demands. *Psychological Review*, 131(2), 349–372.
- 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*.
- 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.<sup>#</sup>, **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]

- 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*. Cambridge, USA. [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*. Oxford, UK. [2 pg., Poster].
- Ritz, H.**, Wolf, W., & Cohen J.D. (2023). Continuous and Discrete Transitions during Task-Switching. *Cognitive Science Society*. Online. [4 pg., Poster].
- Ritz, H.** & Shenhav, A. (2022). Orthogonal neural encoding of targets and distractors supports cognitive control. *Cognitive Computational Neuroscience*. San Francisco, USA. [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*. Toronto, CA. [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*. Toronto, CA. [4 pg., Poster]
- Ritz, H.** & Shenhav, A. (2019). Parametric control of distractor-oriented attention. *Cognitive Science Society*. Montreal, CA. [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*. Montreal, CA. [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*. Ann Arbor, USA. [4 pg., **Poster Spotlight Talk**].

## Chaired Conference Symposia and Workshops

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

## External Seminar Talks

Apr. 2024	<i>Cog Neuro Seminar</i> , Yale University. New Haven, USA.
Dec. 2023	<i>ConCat Series</i> , 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	<i>BLRB Group</i> , University of Chicago.
Oct. 2021	<i>Ghent Effort Group</i> , Ghent University.
Feb. 2020	<i>ConCat Series</i> , New York University. New York, USA.
May 2018	<i>CBC Series</i> , Universitat Pompeu Fabra. Barcelona, ES.

## External Laboratory Talks

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

## Conference Presentations [# trainee]

**Ritz, H.**, Jha, A., Pillow, J., & Cohen J.D. Task preparation is reflected in neural state space dynamics.

- *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]

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.

## Service Roles

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

## Teaching

Spring 2019      *fMRI: Theory and Practice*, Brown University, TA  
Assisted students with:

- Coding fMRI experiments (psychtoolbox in MATLAB)
- Collecting fMRI datasets
- Analyzing fMRI results (SPM12 in MATLAB)

Spring 2018	<i>Cognitive Neuropsychology</i> , Brown University, TA
Fall 2017	<i>Social Psychology</i> , Brown University, TA
2015 – 2016	<i>Statistics using Computers (full year)</i> , Western University, TA <ul style="list-style-type: none"><li>- Ran two lab sections per week on using SPSS for statistical analysis.</li></ul>
2014 – 2015	<i>Sensation and Perception (full year)</i> , Western University, TA
2012 – 2013	<i>Introduction to Psychology (full year)</i> , Queen's University, TA <ul style="list-style-type: none"><li>- Combined with a seminar on psychology of pedagogy.</li></ul>

## Mentorship

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

## Pre-Graduate Research Experience

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

## Ad Hoc Reviewer

Nature Human Behavior; eLife; Journal of Neuroscience; Journal of Experimental Psychology (General, HPP); Imaging Neuroscience; Neuroimage; Cognitive, Affective, & Behavioral Neuroscience; Computational Brain & Behavior