Harrison Ritz

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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.[#], **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., & Cohen J.D. (2023). 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 *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.
Feb. 2020 *ConCat Series*, New York University. New York, USA.
May 2018 *CBC Series*, Universitat Pompeu Fabra. Barcelona, ES.

External Laboratory Talks

Nov. 2023 *Cole Lab*, Rutgers University.
Apr. 2023 *Egner Lab*, Duke University.
Sept. 2022 *Summerfield Lab*, University of Oxford.
June 2022 *BLRB Group*, University of Chicago.
Feb 2022 *Woolgar Lab*, University of Cambridge.
Feb 2022 *Egner Lab*, Duke University.
Nov 2021 *Otto Lab*, McGill University.
Oct. 2021 *Ghent Effort Group*, Ghent 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 *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]

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	*ReMatch+ Summer Mentor,* Princeton University
2023	*PNI Summer Internship Program Mentor*, Leadership Alliance & Princeton University
2022 - Present	*PNI Climate and Inclusion Committee*, 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

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 — *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 psychology of pedagogy.

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: *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*

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

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