

Ian Ballard

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Academic History

University of California, Riverside Assistant Professor, Psychology Department	2023 - present
University of California, San Diego Postdoctoral Researcher, Cognitive Science Department	2023 - 2023
University of California, Berkeley Postdoctoral Researcher, Helen Will Neuroscience Institute	2018 - 2023
Stanford University Ph.D., Neurosciences	2012 - 2018
Duke University B.S., Theoretical Neuroscience	2007 - 2011

Publications

▲ *Denotes open data (OpenNeuro) and code (Github)*

- Ballard, I.C.**, Nix, K., D'Esposito, M.D. Reward reinforcement creates habitual selection of goals. *In Revision. The Journal of Cognitive Neuroscience*.
- Elliott, B., Mohyee, R., **Ballard, I.C.**, Olson, I., Ellman, L., Murty, V.P. In Vivo Structural Connectivity of the Reward System Along the Hippocampal Long-Axis. *Under Review*.
- Lapate, R., **Ballard, I.C.**, Heckner, M., D'Esposito, M.D. Emotional context sculpts action goal representations in the lateral frontal pole. *The Journal of Neuroscience*, 42 (8): 1529–41 (2022).
- Shen, X., **Ballard, I.C.**, Smith, D., Murty, V.P. Decision uncertainty during hypothesis testing has distinct influences on memory accuracy and memory confidence. *Learning and Memory*. 29 (4): 93–99 (2022).
- McDougle, S.D., **Ballard, I.C.**, Baribault, B., Bishop, S., Collins, A.D.E. Executive function assigns value to novel goal-congruent outcomes. *Cerebral Cortex*, 32 (1): 231–47 (2021).
- Radulescu, A., Niv, Y., **Ballard, I.C.** Holistic Reinforcement Learning: The Role of Structure and Attention. *Trends in Cognitive Sciences*, 23(4): 278–92 (2019).
- Ballard, I.C.**, Wagner, A.D., McClure, S.M. Hippocampal Pattern Separation Supports Reinforcement Learning. *Nature Communications*, 10(1): 1073 (2019). ▲
- Ballard, I.C.**, McClure, S.M. Joint Modeling of Choice and Reaction Times Improves Parameter Identifiability in Reinforcement Learning Models. *Journal of Neuroscience Methods*, 317(4): 37–44 (2019). ▲

- Diehl, M., Steele, V., Lempert, L., Parr, A., **Ballard, I.C.**, Smith, D. Toward an Integrative Perspective on the Neural Mechanisms Underlying Persistent Maladaptive Behaviors. *European Journal of Neuroscience*, 48(3): 1870–83 (2018).
- Ballard, I. C.** Kim, B., Aydogan, G., Liatsis, A., Cohen, J.D., McClure, S.M. More Is Meaningful: The Magnitude Effect in Intertemporal Choice Depends on Self-Control. *Psychological Science*, 28(10), 1443–1454 (2017). ▲
- Ballard, I. C.**, Aydogan, G., Kim, B. & McClure, S.M. Causal Evidence for the Dependence of the Magnitude Effect on Dorsolateral Prefrontal Cortex. *Scientific Reports*, 8(1), 16545 (2018). ▲
- Ballard, I.C.**, Miller, E., Piantadosi, S.T., Goodman, N., McClure, S.M. Beyond Reward Prediction Errors: Human Striatum Represents Rule Values During Categorization Learning. *Cerebral Cortex*, 19(3), 1-11 (2017).
- Murty, V.P*, **Ballard, I.C***, Adcock, R.A. Hippocampus and Prefrontal Cortex Predict Distinct Timescales of Activation in the Human Ventral Tegmental Area. *Cerebral Cortex*, 27(2), 1660-1669 (2017).
- *Co-first author
- Ballard, I.C.**, Hennigan, K., McClure, S.M. (2017) Mere Exposure: Preference for Novel Drinks Reflected in Human Ventral Tegmental Area. *Journal of Cognitive Neuroscience*, 29, 793–804 (2017).
- Murty, V. P., **Ballard, I. C.**, Macduffie, K. E., Krebs, R. M. & Adcock, R. A. Hippocampal networks habituate as novelty accumulates. *Learning & Memory*, 20, 229–235 (2013).
- Ballard, I.C.***, Murty, V.P.*, Carter R.M., MacInnes J.J., Huettel S.A., Adcock R.A. Dorsolateral prefrontal cortex drives mesolimbic dopaminergic regions to initiate motivated behavior. *Journal of Neuroscience*, 31(28), 10340-6. (2011).
- Samanez-Larkin, G.R., Mata, R., Radu, P.T., **Ballard, I.C.**, Carstensen, L.L., McClure, S.M. Age differences in striatal delay sensitivity during intertemporal choice in healthy adults. *Frontiers in Neuroscience*, 5, 126. (2011).

In-prep Manuscripts

- Leong, Y.C. and **Ballard, I.C.** In the mind of the beholder: Neurocomputational approaches to motivated seeing. *Trends in Cognitive Sciences*. *Invited submission*.
- Ballard, I.C.***, Pappas, I.*, Furman, D., Berry, A., White, R., Jagust, W.J., Kaiser, A., D’Esposito, M.D. Hemodynamic correlates of striatal dopamine. *Society for Neuroscience*, 2022.
- Schuman, I.*, Yang, J.*, **Ballard, I.C.**, Lapate, R. Waiting for it: Anorexia Risk, Future Orientation, and Intertemporal Discounting
- Ballard, I.C.***, Pappas, I.*, Furman, D., Berry, A., White, R., Jagust, W.J., Kaiser, A., D’Esposito, M.D. Hemodynamic correlates of striatal dopamine. *Society for Neuroscience*, 2022.
- Ballard, I.C.**, D’Esposito, M.D. Striatum updates goal values to support behavioral flexibility. *Society for Neuroscience*, 2019 and *Cognitive Neuroscience Society*, 2020.
- Ballard, I.C.**, Furman, D., Berry, A., White, R., Jagust, W.J., Kaiser, A., D’Esposito, M.D. Dopaminergic modulation of implicit learning in humans. *Society for Neuroscience*, 2021.

Ballard, I.C., Pappas, I., Peters, J., D'Esposito, M.D. Orbifrontal cortex lesions disrupt hippocampal network connectivity. *Cognitive Neuroscience Society*, 2021.

Ongoing Projects

Ballard, I.C., Lapate, R., Kiyonaga, A., McDougle, S., D'Esposito, M.D. Inhibitory TMS improves decision-making by reducing competition between learning systems.

Ballard, I.C.*, Pappas, I.*, D'Esposito, M.D. Deep learning models reveal hidden structure in human reward generalization.

Fellowships and Awards

<u>NIMH F32 Postdoctoral Ruth L. Kirschstein NRSA</u>	2020
Kavli Summer Institute in Cognitive Neuroscience	2016
Neuroeconomics Society Summer School	2015
Stanford Mind Brain and Computation Fellowship	2013
<u>National Science Foundation Graduate Research Fellowship Program</u>	2012
Duke University Scholars Full Tuition Merit Scholarship	2007

Professional Activities

Invited Talks

Yale University Psychology Colloquium (2023) • UC Davis Memory Meeting (2022) • Brown University Shenhav Lab Meeting (2022) • NYU Concepts and Categories Series (2022) • UCSB Cognitive Psychology Colloquium (2021) • UCLA Cognitive Psychology Forum (2021) • Memory and Context Meeting (2021) • Brown University Feldman Hall Lab Meeting (2021) • Columbia University Psychology Colloquium (2020) • Stanford University SPANLab Meeting (2020) • ASU Cognitive Brown Bag (2020)

Conference Organization

Created, organized and led COSYNE Workshop: *Hippocampal computations and interactions supporting learning and decision-making* (2018)

Conference Talks

Cognitive Neuroscience Society Symposium (2022) • Cognitive Neuroscience Society DataBlitz (2020/21) • Cognitive Computational Neuroscience (2017) • Interdisciplinary Symposium on Decision Neuroscience (2017) • Society for Neuroeconomics Spotlight (2016) • Society for Neuroscience Nanosymposium (2015)

Ad Hoc Reviewing

Psychological Review • Nature Communications • Current Biology • Cerebral Cortex • Cognition • Journal of Cognitive Neuroscience • Scientific Reports • Hippocampus • Neuroimage • Social Cognitive and Affective Neuroscience • PLOS One • Brain Imaging and Behavior • Memory and Cognition • Bulletin of Mathematical Biology • Journal of Mathematical Psychology • Journal of Economic Psychology

Teaching

The Nervous System <i>Medical school course. Led neuroanatomy lab and taught neurobiology</i>	5 years (2014-2018)
Learning and Memory <i>Undergraduate course. Teaching Assistant and guest-lecturer on statistical learning</i>	2016
Developmental Psychology <i>Led scientific writing section</i>	2014

Mentorship

Masters thesis

Corrina Laube. *Now postdoc* • Anna Moretti. *Now PhD student*

Undergraduate

Catherine Holland (*Now PhD student*) • Jesse Amand (*Now PhD student*) • Kerry Nix (*Now Lab Manager*) • Sheena Horiki (*Senior Thesis*) • Cindy Choi

Travel Awards

Computational Cognitive Neuroscience (2017) • *Stanford Biosciences (2017)* • *Persistent Maladaptive Behaviors Symposium (2016)* • *Reinforcement Learning and Decision Making (2015)* • *Neuroeconomics Society (2013)*