Stanford



Neir Eshel, MD, PhD

Assistant Professor of Psychiatry and Behavioral Sciences (Major Laboratories & Clinical Translational Neurosciences Incubator)

Curriculum Vitae available Online

CLINICAL OFFICE (PRIMARY)

- **Psychiatry**

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Bio

BIO

Dr. Eshel (he/him/his) is a tenure-track Assistant Professor in the Department of Psychiatry & Behavioral Sciences at Stanford University School of Medicine.

His clinical focus is the full-spectrum mental health care of sexual and gender minorities, with particular interest in depression, anxiety, and the complex effects of trauma in this population. He works in collaboration with other primary care and mental health providers at the Stanford LGBTQ+ program.

His research interests (www.staarlab.com) include the use of optogenetic, electrophysiological, neuroimaging, and behavioral approaches to probe the neural circuits of reward processing, decision making, and social behavior. He has won multi-year grants from the National Institutes of Health, Burroughs-Wellcome Fund, One Mind Foundation, Sergey Brin Family Foundation, Brain and Behavior Research Foundation, and Simons Foundation to further his research.

Dr. Eshel has published articles on the behavioral roles for dopamine, serotonin, and acetylcholine; the neuroscience of irritability, depression, and addiction; LGBTQ health; and the mechanism of transcranial magnetic stimulation. His work has appeared in Nature, Science, Neuron, Nature Neuroscience, Annual Review of Neuroscience, JAMA, JAMA Psychiatry, Neuropsychopharmacology, Proceedings of the National Academy of Sciences, and the Journal of Neuroscience, among other leading journals. He is a co-inventor on a patent for a new class of drugs for addiction, and also the author of the book Learning: The Science Inside, a publication of the American Association for the Advancement of Science.

He has delivered presentations on the neural circuits of motivated behavior, anger expression in patients with PTSD, how dopamine facilitates learning, and LGBTQ-related topics at keynotes and invited seminars in >10 countries. He is also an associate editor of the Journal of Gay and Lesbian Mental Health, and an ad-hoc reviewer for numerous publications including Nature, Science, Neuron, Nature Communications, JAMA Psychiatry, Biological Psychiatry, and Current Biology.

Dr. Eshel has won honors for his scholarship and advocacy, including the Marshall Scholarship, the One Mind Rising Star Award, the Outstanding Resident Award from the National Institute of Mental Health, the Science and SciLifeLab Grand Prize for Young Scientists, the Freedman Award (honorable mention) from the Brain and Behavior Research Foundation, the Polymath Award from Stanford's psychiatry department, and the National LGBT Health Achievement Award.

He is a member of the American Psychiatric Association, American College of Neuropsychopharmacology, Society of Biological Psychiatry, Association of Gay & Lesbian Psychiatrists, Society for Neuroscience, and other professional associations. He is also an advocate for LGBTQ rights, recently serving as the chair of Stanford's LGBTQ+ Benefits Advocacy Committee.

Prior to Stanford, Dr. Eshel trained and conducted research at the National Institutes of Health, Princeton University, the World Health Organization, University College London, and Harvard University.

CLINICAL FOCUS

- Psychiatry

ACADEMIC APPOINTMENTS

- Assistant Professor, Psychiatry and Behavioral Sciences
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Wu Tsai Neurosciences Institute

PROFESSIONAL EDUCATION

- Board Certification: Psychiatry, American Board of Psychiatry and Neurology (2020)
- Residency: Stanford University Psychiatry and Behavioral Sciences (2020) CA
- Medical Education: Harvard Medical School (2016) MA

LINKS

- My lab site: www.staarlab.com

Teaching

COURSES

2026-27

- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Spr)

2025-26

- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Aut, Win, Spr)

2024-25

- Neuroscience Journal Club and Professional Development Series: NEPR 280 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Lucas Encarnacion-Rivera, Sabrina Jones

Postdoctoral Faculty Sponsor

Ja Eun Choi, Hyoungro Lee, Misha Raffiee, Yitao Wang

Doctoral Dissertation Advisor (AC)

Pia Alderman, Ashley Moses

Publications

PUBLICATIONS

- **Dopamine and serotonin inversely modulate D2 medium spiny neurons to regulate cocaine reward.** *Nature communications*
  Cardozo Pinto, D. F., Guo, M. Y., Pomrenze, M. B., Morishita, W., Li, M. X., Zweifel, L. S., Eshel, N., Malenka, R. C.
  2026
- **Serotonin modulates nucleus accumbens circuits to suppress aggression in mice.** *Nature communications*
  Zhang, Z., Touponse, G. C., Alderman, P. J., Yassine, T., Pomrenze, M. B., Harris, T. W., Shank, A. N., Malenka, R. C., Eshel, N.
  2026
- **Cholinergic modulation of dopamine release drives effortful behaviour.** *Nature*
  Touponse, G. C., Pomrenze, M. B., Yassine, T., Denomme, N., Wang, M., Mehta, V., Zhang, Z., Malenka, R. C., Eshel, N.
  2026
- **DISTINCT ENCODING OF REWARD AND AVERSION BY D1 CELL SUBTYPES IN THE NUCLEUS ACCUMBENS**
  Pomrenze, M., Denomme, N., Baek, J., Wang, M., Touponse, G., Tucciarone, J., Eshel, N., Malenka, R.
  SPRINGERNATURE.2026
- **Serotonin modulates nucleus accumbens circuits to suppress aggression.** *bioRxiv : the preprint server for biology*
  Zhang, Z., Touponse, G. C., Alderman, P. J., Yassine, T., Pomrenze, M. B., Harris, T. W., Shank, A. N., Malenka, R. C., Eshel, N.
  2025
- **I've got a friend in you: How the brain socializes during opioid withdrawal.** *Neuron*
  Zhang, Z., Pomrenze, M. B., Eshel, N.
  2025; 113 (21): 3498-3500
- **5-HT2C receptors in the nucleus accumbens constrain the rewarding effects of MDMA.** *Molecular psychiatry*
  Pomrenze, M. B., Vaillancourt, S., Salgado, J. S., Raymond, K. B., Llorach, P., Sacai, H., Rijsketic, D. R., Hietamies, T. M., Touponse, G. C., Cardozo Pinto, D. F., Rastegar, Z., Casey, A. B., Eshel, et al
  2025
- **Cholinergic modulation of dopamine release drives effortful behavior.** *bioRxiv : the preprint server for biology*
  Touponse, G. C., Pomrenze, M. B., Yassine, T., Mehta, V., Denomme, N., Zhang, Z., Malenka, R. C., Eshel, N.
  2025
- **Review: Dopamine, Serotonin, and the Translational Neuroscience of Aggression in Autism Spectrum Disorder.** *JAACAP open*
  Martin, H., Choi, J. E., Rodrigues, A. R., Eshel, N.
  2025; 3 (1): 29-41
- **CHOLINERGIC INTERNEURONS GATE DOPAMINE RELEASE TO DRIVE EFFORTFUL BEHAVIOR**
  Touponse, G., Pomrenze, M., Yassine, T., Zhang, Z., Malenka, R., Eshel, N.
  SPRINGERNATURE.2024: 511
- **GATING OF OPIOID WITHDRAWAL AVERSION BY AN ECCENTRIC D1 CELL-TYPE IN THE NUCLEUS ACCUMBENS**
  Pomrenze, M., Tucciarone, J., Touponse, G., Denomme, N., St Laurent, R., Baek, J., Chen, A., Phan, B., Soares, J., Pinto, D., Guo, M., Shank, A., Pfenning, et al
  SPRINGERNATURE.2024: 249
- **Opponent control of reinforcement by striatal dopamine and serotonin.** *Nature*
  Cardozo Pinto, D. F., Pomrenze, M. B., Guo, M. Y., Touponse, G. C., Chen, A. P., Bentzley, B. S., Eshel, N., Malenka, R. C.
  2024
- **5-HT2Creceptors in the nucleus accumbens constrain the rewarding effects of MDMA.** *bioRxiv : the preprint server for biology*

Pomrenze, M. B., Vaillancourt, S., Salgado, J. S., Raymond, K. B., Llorach, P., Touponse, G. C., Cardozo Pinto, D. F., Rastegar, Z., Casey, A. B., Eshel, N., Malenka, R. C., Heifets, B. D.
2024

- **Simple Behavioral Analysis (SimBA) as a platform for explainable machine learning in behavioral neuroscience.** *Nature neuroscience*
  Goodwin, N. L., Choong, J. J., Hwang, S., Pitts, K., Bloom, L., Islam, A., Zhang, Y. Y., Szelenyi, E. R., Tong, X., Newman, E. L., Miczek, K., Wright, H. R., McLaughlin, et al
  2024

- **A New Paradigm to Investigate the Neuroscience of Irritability in Youth.** *Biological psychiatry global open science*
  Martin, H., Eshel, N.
  2024; 4 (2): 100288

- **Gating of Opioid Withdrawal Aversion by a Unique Class of Neurons in the Nucleus Accumbens**
  Tucciarone, J., Pomrenze, M., Baek, J., Zhang, Z., Touponse, G., Shank, A., Neumann, P., Eshel, N., Malenka, R.
  SPRINGERNATURE.2023: 492-493

- **Striatal dopamine integrates cost, benefit, and motivation.** *Neuron*
  Eshel, N., Touponse, G. C., Wang, A. R., Osterman, A. K., Shank, A. N., Groome, A. M., Taniguchi, L., Cardozo Pinto, D. F., Tucciarone, J., Bentzley, B. S., Malenka, R. C.
  2023

- **Perspective on equitable translational studies and clinical support for an unbiased inclusion of the LGBTQIA2S +community.** *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*
  Goetz, T. G., Aghi, K., Anacker, C., Ehrensaft, D., Eshel, N., Marrocco, J., Young, J. W., Roepke, T. A.
  2023

- **Behavioral Economics of Striatal Dopamine**
  Eshel, N., Touponse, G., Wang, A., Osterman, A., Shank, A., Groome, A., Taniguchi, L., Pinto, D., Tucciarone, J., Bentzley, B., Malenka, R.
  SPRINGERNATURE.2022: 519-520

- **Modulation of 5-HT release by dynorphin mediates social deficits during opioid withdrawal.** *Neuron*
  Pomrenze, M. B., Cardozo Pinto, D. F., Neumann, P. A., Llorach, P., Tucciarone, J. M., Morishita, W., Eshel, N., Heifets, B. D., Malenka, R. C.
  2022

- **Rethinking the Physician-Scientist Pathway.** *Academic medicine : journal of the Association of American Medical Colleges*
  Eshel, N., Chivukula, R. R.
  2022

- **A comparison of 'pruning' during multi-step planning in depressed and healthy individuals.** *Psychological medicine*
  Faulkner, P., Huys, Q. J., Renz, D., Eshel, N., Pilling, S., Dayan, P., Roiser, J. P.
  2021: 1–9

- **Neural correlates of anger expression in patients with PTSD.** *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*
  Eshel, N., Maron-Katz, A., Wu, W., Abu-Amara, D., Marmar, C. R., Etkin, A.
  2021

- **Mouse Model of Frustration Reveals a Role for Striatal Dopamine at the Intersection of Reward and Aggression**
  Eshel, N.
  SPRINGERNATURE.2020: 5

- **Intervene or Innovate: a Dilemma for Psychiatrists-in-Training.** *Academic psychiatry : the journal of the American Association of Directors of Psychiatric Residency Training and the Association for Academic Psychiatry*
  Morris, N. P., Eshel, N. n.
  2020

- **Global connectivity and local excitability changes underlie antidepressant effects of repetitive transcranial magnetic stimulation.** *Neuropsychopharmacology : official publication of the American College of Neuropsychopharmacology*
  Eshel, N. n., Keller, C. J., Wu, W. n., Jiang, J. n., Mills-Finnerty, C. n., Huemer, J. n., Wright, R. n., Fonzo, G. A., Ichikawa, N. n., Carreon, D. n., Wong, M. n., Yee, A. n., Shpigel, et al

2020

- **The Role of Dopamine in Reward-Related Behavior: Shining New Light on an Old Debate.** *Journal of neurophysiology*
  Wang, A. R., Groome, A. M., Taniguchi, L. n., Eshel, N. n., Bentzley, B. S.
  2020
- **Neural Correlates of Anger Expression in Patients With PTSD**
  Eshel, N., Maron-Katz, A., Marmar, C., Etkin, A.
  NATURE PUBLISHING GROUP.2019: 87
- **Anger Expression in Patients With PTSD: Clinical, Cognitive, and Neural Correlates**
  Eshel, N., Maron-Katz, A., Marmar, C., Etkin, A.
  ELSEVIER SCIENCE INC.2019: S137
- **New Frontiers in Irritability Research-From Cradle to Grave and Bench to Bedside.** *JAMA psychiatry*
  Eshel, N. n., Leibenluft, E. n.
  2019
- **Physicians Talking With Their Partners About Patients.** *JAMA*
  Morris, N. P., Eshel, N. n.
  2019
- **Learning what to approach.** *PLoS biology*
  Eshel, N., Steinberg, E. E.
  2018; 16 (10): e3000043
- **Learning what to approach** *PLOS BIOLOGY*
  Eshel, N., Steinberg, E. E.
  2018; 16 (10)
- **Lesbian, Gay, Bisexual, Transgender, and Queer/Questioning Students** *STUDENT MENTAL HEALTH: A GUIDE FOR PSYCHIATRISTS, PSYCHOLOGISTS, AND LEADERS SERVING IN HIGHER EDUCATION*
  Shah, R., Eshel, N., McGlynn, L.
  edited by Roberts, L. W.
  2018: 411–24
- **The Neural Basis of Aversive Pavlovian Guidance during Planning** *JOURNAL OF NEUROSCIENCE*
  Lally, N., Huys, Q. J. M., Eshel, N., Faulkner, P., Dayan, P., Roiser, J. P.
  2017; 37 (42): 10215–29
- **Curricular Time, Patient Exposure, and Comfort Caring for Lesbian, Gay, Bisexual, and Transgender Patients Among Recent Medical Graduates.** *LGBT health*
  Honigberg, M. C., Eshel, N., Luskin, M. R., Shaykevich, S., Lipsitz, S. R., Katz, J. T.
  2017; 4 (3): 237-239
- **Effect of rTMS on Resting-State Functional Connectivity in Patients with Major Depression**
  Eshel, N., Huemer, J., McTeague, L., Wong, M., Yee, A., Patenaude, B., de los Angeles, C., Etkin, A.
  ELSEVIER SCIENCE INC.2017: S259
- **Neural Circuitry of Reward Prediction Error.** *Annual review of neuroscience*
  Watabe-Uchida, M., Eshel, N., Uchida, N.
  2017
- **Trial and error.** *Science*
  Eshel, N.
  2016; 354 (6316): 1108-1109
- **Dopamine neurons share common response function for reward prediction error** *NATURE NEUROSCIENCE*
  Eshel, N., Tian, J., Bukwich, M., Uchida, N.
  2016; 19 (3): 479-?

- **Psychiatric Consultations in Less-Than-Private Places: Challenges and Unexpected Benefits of Hospital Roommates** *PSYCHOSOMATICS*
  Eshel, N., Marcovitz, D. E., Stern, T. A.
  2016; 57 (1): 97-101

- **Arithmetic and local circuitry underlying dopamine prediction errors** *NATURE*
  Eshel, N., Bukwich, M., Rao, V., Hemmelder, V., Tian, J., Uchida, N.
  2015; 525 (7568): 243-?

- **Interplay of approximate planning strategies** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Huys, Q. J., Lally, N., Faulkner, P., Eshel, N., Seifritz, E., Gershman, S. J., Dayan, P., Roiser, J. P.
  2015; 112 (10): 3098-3103

- **Dopamine gates sensory representations in cortex** *JOURNAL OF NEUROPHYSIOLOGY*
  Eshel, N., Tian, J.
  2014; 111 (11): 2161-2163

- **Division of Labor for Division: Inhibitory Interneurons with Different Spatial Landscapes in the Olfactory System** *NEURON*
  Uchida, N., Eshel, N., Watabe-Uchida, M.
  2013; 80 (5): 1106-1109

- **Opening the black box: dopamine, predictions, and learning** *TRENDS IN COGNITIVE SCIENCES*
  Eshel, N., Tian, J., Uchida, N.
  2013; 17 (9): 430-431

- **Role of prefrontal cortex and the midbrain dopamine system in working memory updating** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  D'Ardenne, K., Eshel, N., Luka, J., Lenartowicz, A., Nystrom, L. E., Cohen, J. D.
  2012; 109 (49): 19900-19909

- **Bonsai Trees in Your Head: How the Pavlovian System Sculpts Goal-Directed Choices by Pruning Decision Trees** *PLOS COMPUTATIONAL BIOLOGY*
  Huys, Q. J., Eshel, N., O'Nions, E., Sheridan, L., Dayan, P., Roiser, J. P.
  2012; 8 (3)

- **Effects of parietal TMS on somatosensory judgments challenge interhemispheric rivalry accounts** *NEUROPSYCHOLOGIA*
  Eshel, N., Ruff, C. C., Spitzer, B., Blankenburg, F., Driver, J.
  2010; 48 (12): 3470-3481

- **Reward and Punishment Processing in Depression** *BIOLOGICAL PSYCHIATRY*
  Eshel, N., Roiser, J. P.
  2010; 68 (2): 118-124

- **Interhemispheric Effect of Parietal TMS on Somatosensory Response Confirmed Directly with Concurrent TMS-fMRI** *JOURNAL OF NEUROSCIENCE*
  Blankenburg, F., Ruff, C. C., Bestmann, S., Bjoertomt, O., Eshel, N., Josephs, O., Weiskopf, N., Driver, J.
  2008; 28 (49): 13202-13208

- **Neural substrates of choice selection in adults and adolescents: Development of the ventrolateral prefrontal and anterior cingulate cortices** *NEUROPSYCHOLOGIA*
  Eshel, N., Nelson, E. E., Blair, R. J., Pine, D. S., Ernst, M.
  2007; 45 (6): 1270-1279

- **Responsive parenting: interventions and outcomes** *BULLETIN OF THE WORLD HEALTH ORGANIZATION*
  Eshel, N., Daelmans, B., de Mello, M. C., Martines, J.
  2006; 84 (12): 991-998

- **Behavioral predictors of substance-use initiation in adolescents with and without attention-deficit/hyperactivity disorder** *PEDIATRICS*
  Ernst, M., Luckenbaugh, D. A., Moolchan, E. T., Leff, M. K., Allen, R., Eshel, N., London, E. D., Kimes, A.
  2006; 117 (6): 2030-2039

- **Reward-related processes in pediatric bipolar disorder: a pilot study** *JOURNAL OF AFFECTIVE DISORDERS*
  Ernst, M., Dickstein, D. P., Munson, S., Eshel, N., Pradella, A., Jazbec, S., Pine, D. S., Leibenluft, E.
  2004; 82: S89-S101
- **Choice selection and reward anticipation: an fMRI study** *NEUROPSYCHOLOGIA*
  Ernst, M., Nelson, E. E., McClure, E. B., Monk, C. S., Munson, S., Eshel, N., Zarahn, E., Leibenluft, E., Zametkin, A., Towbin, K., Blair, J., Charney, D., Pine, et al
  2004; 42 (12): 1585-1597