Duke University School of Medicine
311 Research Drive
Durham, NC 27710

# Isabella Pauline Fallon ipf@duke.edu

## Research Interests

I am interested in understanding the neural circuit mechanisms underlying goal-directed movements. I aim to leverage these findings to build innovative biomedical devices that restore loss of motor function and improve quality of life.

**Skills and Expertise:** behavioral testing, optogenetics, chemogenetics, *in-vivo* endoscopic calcium imaging, *in-vivo* fiber photometry, pharmacology, inducible systems for activity-dependent labeling, confocal microscopy, viral-mediated gene delivery, anatomical tract tracing, immunofluorescence, med-associates programming, Minian (Ca analysis), 2D&3D pose estimation, MATLAB, all google programs, NeuroExplorer, Adobe illustrator, Adobe Premiere Pro, Adobe Acrobat, GraphPad, ImageJ, Plexon, Jupyter Notebooks.

## Current Position

**Postdoctoral associate**, Psychology and Neuroscience,
Duke University School of Medicine, NC

## Education

**PhD**, Neurobiology
Duke University School of Medicine, NC 2019 -2024
Thesis title: *Striatal Pathways for Action Counting and Steering*
Thesis advisor: Henry Yin
Thesis committee: Nicole Calakos, Michael Tadross, Rebecca Yang

**BA**, Neuroscience
University of Colorado Boulder, Boulder, CO 2013-2017
Honors in Neuroscience, *Cum Laude*
Thesis title: *Evaluating Stressor Controllability Effects in Female Rats*
Thesis advisor: Steven Maier
Thesis committee: Kathryn Plath, Heidi Day, Michael Baratta

**Relevant Coursework***:* Lab Techniques in Neuroscience, Introduction to Neuroscience, Neuropharmacology, Neurobiology of Learning and Memory, Organic Chemistry 2, Molecular Cell Biology, Statistics/Research Methods, Behavioral Neuroendocrinology, Calculus, General Physics 2, Scientific Writing

**Study Abroad**, Neuroscience
University of Sussex, Brighton, England 2015-2016

**Relevant Coursework***:* Neuronal Transduction and Transmission, Biological Bases of Mental Disorders, Cognitive Neuroscience, Genetics and Genomics

## Past Research Experience

**Professional Research Associate**, Department of Psychology and Neuroscience, University of Colorado Boulder, 2017-201
Principal Investigator: Steven Maier

**Undergraduate Research Assistant**, Department of Psychology and Neuroscience, University of Colorado Boulder, 2014-2017
Principal Investigator: Steven Maier

**Undergraduate Research Assistant**, Department of Anesthesiology, University of Colorado Anschutz Medical Campus, 2016
Principal Investigator: Slobodan Todorovic

## Other Relevant Experience

**Nucleate leadership team,** Communications**,** Duke University School of Medicine 2021

Nucleate is a student-run non-profit organization that facilitates the formation of new life science ventures. As the communications board member of the nucleate leadership team, it was my job to coordinate communication between local biotech companies, researchers at institutions, students in biomedical PhDs, and the Fuqua School of Business. I created programs and flyers for nucleate-sponsored events.

**Advisory Board Member and Website Manager,** Special Undergraduate Enrichment Programs, University of Colorado Boulder, 2016

The Special Undergraduate Enrichment Program was designed to enhance excelling students' education by providing grants for scientific research and professional development education courses. As a board member, it was my job to promote undergraduate research on the CU Boulder campus and facilitate faculty-student partnerships. In addition, I managed the program's communications using the platform Web Express powered by Drupal.

## Publications

**Fallon IP**, Fernandez SO, Hong F, Yin HH. Striatal pathways steer forelimb reach extension. (2024). ***In preparation.***

**Fallon IP**, Roshchina M, Hong F, Fernandez SO, Ruan S, Yin HH. Striatal pathways for action counting and steering. (2024). ***In preparation.***

**Fallon IP**, Dolzani SD, Leslie NR, Amat J, Trahan GD, Laynes RA, Watkins LR, Maier SF, Baratta, MV*.* Coping with stress promotes long-term resilience through distinct prefrontal circuits. (2024). ***In preparation.***

**Fallon IP**, Hughes RN, Severino FPU, Kim N, Lawry CM, Watson GDR, Roschina M, Yin HH. The role of the parafascicular thalamic nucleus in action initiation and steering. (2023). ***Current Biology.***

Bakhurin K, Hughes, RN, Jiang Q, **Fallon IP** Yin, HH Force tuning explains changes in phasic dopamine signaling during stimulus-reward learning. (2023). ***Biorxiv.***

Petter EA, **Fallon IP,** Hughes RN, Watson GDR, Meck WH, Ulloa Severino FP, Yin HH. Elucidating a locus coeruleus-dentate gyrus dopamine pathway for operant reinforcement. (2023). ***Elife.***

Hassell JE, Baratta MV, **Fallon IP,** Siebler PH, Karns BL, Nguyen KT, Gates CA, Fonken LK, Frank MG, Maier SF, Lowry CA. Immunization with a heat-killed preparation of Mycobacterium vaccae NCTC 11659 enhances auditory-cued fear extinction in a stress-dependent manner. (2022). ***Brain Behavior and Immunity.***

McNulty CJ*, **Fallon IP***, Amat J, Sanchez RJ, Leslie NR, Root DH, Maier SF, Baratta MV. Elevated prefrontal dopamine interferes with the stress-buffering properties of behavioral control in female rats. (2022). ***Neuropsychopharmacology.***

Zhang J, Hughes RN, Kim N, **Fallon IP**, Bakhurin K, Kim J, Severino FPU, Yin HH. A one-photon endoscope for simultaneous patterned optogenetic stimulation and calcium imaging in freely behaving mice. (2023). ***Nature Biomedical Engineering.***

Watson GDR, Hughes RN, Petter EA, **Fallon IP**, Kim N, Severino FPU, Yin HH. Thalamic projections to the subthalamic nucleus contribute to movement initiation and rescue of parkinsonian symptoms. (2021). ***Science Advances.***

Frank MG, Baratta MV, Zhang K, **Fallon IP**, Pearson MA, Liu G, Hutchinson MR, Watkins LR, Goldys EM, Maier SF. Acute stress induces the rapid and transient induction of caspase-1, gasdermin D and release of constitutive IL-1β protein in dorsal hippocampus. (2020). ***Brain Behavior and Immunity.***

**Fallon IP**, Tanner MK, Greenwood BN, Baratta MV. (2019). Sex differences in resilience: experiential factors and their mechanisms. ***European Journal of Neuroscience***.

Tanner MK, **Fallon IP**, Baratta MV, Greenwood BN. Voluntary exercise enables stress resistance in females. (2019). ***Behavioural Brain Research***, 369.

Baratta MV, Leslie NR, **Fallon IP**, Dolzani SD, Chun LE, Tamalunas AM, Watkins LR, Maier SF. (2018). Behavioural and neural sequelae of stressor exposure are not modulated by controllability in females. ***European Journal of Neuroscience***, 47, 959-967.

## Conference Poster Presentations

Yin HH, Bakhurin K, **Fallon IP**, O.Jiang, M.Hossain, B.Gutkin. (Fall 2022). Deconstructing the Reward Prediction Error Hypothesis of Dopamine Function. *Society for Neuroscience,* Chicago, Illinois.

**Fallon IP**, Roshchina M, Hong F, Vignali C, Fernandez SO Fernandez SO, Yin HH. (Fall 2022). The Role of Striatal Neurons in Counting Behavior. *Society for Neuroscience,* Chicago, Illinois.

Hong F, **Fallon IP,** Yin HH. (Fall 2022). Striatal Direct and Indirect Pathway Neurons Play Complementary Roles in Action. *Society for Neuroscience,* Chicago, Illinois.

**Fallon IP**, Fernandez SO, Yin HH. (Fall 2022). The striatal indirect pathway resets the neural representation of numerosity. *The Assembly and Function of Neuronal Circuits,* Ascona, Switzerland.

**Fallon IP**, Fernandez SO, Yin HH. (Fall 2022). The striatal indirect pathway resets the neural representation of numerosity. *Society for Neuroscience,* San Diego, California.

Bakhurin K, Hughes RN, **Fallon IP,** Yin HH. (Fall 2022). Ventral tegmental dopamine neurons signal force vector dynamics during Pavlovian conditioning and performance. *Society for Neuroscience,* San Diego, California.

McNulty CJ, **Fallon IP**, Amat J, Sanchez RJ, Root DH, Maier SF, Baratta MV. (Fall 2022). Behavioral control over stress recruits a distinct circuit in females. *Society for Neuroscience,* San Diego, California.

Bonar KK, Tanner MK, **Fallon IP**, Baratta MV, Greenwood BN. (Fall, 2019). Exercise effects on activation of dorsal raphe nucleus-projecting neurons during uncontrollable stress. *Front Range Neuroscience Group*, Fort Collins, CO.

**Fallon IP,** Fernandez SO, Yin HH. (Fall 2022). The striatal indirect pathway resets the neural representation of numerosity. *The Assembly and Function of Neuronal Circuits,* Monte Verita, Switzerland.

**Fallon IP,** Levy ES**,** Dolzani SD, Leslie NR, Amat J, Trahan GD, Laynes RA, Watkins LR, Baratta MV, Maier SF. (Fall, 2019). Control over stress engages a corticostriatal projection for the production of long-term stress resilience. *Ascona Circuits Meeting,* Monte Verita, Switzerland.

**Fallon IP,** Tanner MK, Tamalunas AM, Baratta MV, Greenwood BN (Fall, 2019) Voluntary wheel running prevents the behavioral and neurochemical sequelae of uncontrollable stress in females. *Society for Neuroscience*, Chicago, Illinois.

Tanner MK, **Fallon IP**, Baratta MV, Greenwood BN. (Fall, 2018) Wheel running prevents the negative impact of stressor exposure in females. *Front Range Neuroscience Group***,** Fort Collins, Colorado.

Levy ES, **Fallon IP,** Baratta MV, Leslie NR, Watkins LR, Maier SF. (Fall, 2018). Determining prefrontal projections involved in the production of long-term stress resilience. *Molecular and Cellular Cognition Society,* San Diego, California.

Baratta MV, Dolzani SD, **Fallon IP**, Leslie NR, Amat J, Trahan GD, Laynes RA, Watkins LR, Maier SF. (Fall, 2018). Control over stress engages a corticostriatal projection for the production of long-term stress resilience. *Society for Neuroscience,* San Diego, California.

**Fallon IP**, Baratta MV, Leslie NR, Dolzani SD, Chun LE, Tamalunas AM, Watkins LR, Maier SF. (Summer, 2018). Behavioral and neural sequelae of stressor exposure are not modulated by controllability in females. *Neurobiology of Stress Workshop,* Banff, Canada.

**Fallon IP**, Baratta MV, Leslie NR, Dolzani SD, Chun LE, Tamalunas AM, Watkins LR, Maier SF. (Fall, 2017). Evaluating Stressor Controllability Effects in Female Rats. *Society for Neuroscience,* Washington D.C.

## Conference Oral Presentations

| | |
|---|---|
| 2023 | Striatal mechanisms underlying counting behavior. Seminar series, Duke University School of Medicine, Durham, North Carolina. |
| 2022 | Investigating the role of striatal indirect pathway neurons in quantity estimation. Basal Ganglia Symposium, Duke University School of Medicine, Durham, North Carolina. |
| 2019 | Control over stress engages a corticostriatal projection for the production of long-term stress resilience, *Ascona Circuits Meeting,* Monte Verita, Switzerland. |
| 2017 | Evaluating Stressor Controllability Effects in Female Rats, *Rocky Mountain Regional Neuroscience Group*, University of Colorado Anschutz Medical Campus, Denver, Colorado. |

## Honors and Awards

| | |
|---|---|
| 2018 | 2018 Women Who Make a Difference Nominee |
| 2017 | Biological Sciences Initiative Travel Grant |
| 2017 | Best Abstract Award, Rocky Mountain Regional Neuroscience Group |
| 2017 | Best Undergraduate Thesis in Neuroscience Award |
| 2016 | Undergraduate Research Opportunities Program Research Assistantship Award |
| 2016 | Undergraduate Research Opportunities Program Individual Grant |
| 2015 | Undergraduate Research Opportunities Program-HMMI Research Grant |
| 2015 | Biological Sciences Initiative Scholars Program Summer Award Research Grant |

## Mentoring Activities

| | |
|---|---|
| 2022 – 2024 | Mentor, URS program, Duke University |
| 2020 – 2021 | Duke athletics student mentor, Duke University |
| 2017 – 2018 | Mentor, BSI program, University of Colorado Boulder |