Zachary T. Pennington, PhD

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I'm a behavioral neuroscientist with 13+ years of experience leading in vivo translational studies on CNS disorders, including anxiety disorders, addiction, and age-related cognitive decline. Skilled at integrating advanced technologies for recording and manipulating brain circuits in rodents with behavioral analyses in order to identify and assess disease targets. I have also spearheaded the development of several funded projects and have a variety of leadership experiences. I'm passionate about mental health and love working with creative teams to answer new questions.

Education

2018 **PhD, Behavioral Neuroscience and Quantitative Psychology. UCLA** (GPA 3.97)

2010 **BA, Psychology. UCLA** (GPA 3.97)

Experience

2023-Present **Instructor, Icahn School of Medicine at Mount Sinai**

- *Lead two projects to discover novel biomarkers for fear/anxiety disorders utilizing transgenic mice, viral delivery, neural circuit recordings/manipulation, and transcriptomics.*
- *Trained and managed 2 technicians.*
- *Secured independent funding for projects.*

2018-2022 **Postdoctoral Fellow, Icahn School of Medicine at Mount Sinai**

- *Published 10 papers (5 first author; 5 collaborative).*
- *Developed assays to measure distinct fear/anxiety behaviors and their biological origins in mice (Pennington et al, 2023).*
- *Developed video analysis software for rodent behavioral tracking (Pennington et al, 2023, github.com/denisecailab/eztrack).*
- *Utilized calcium imaging with miniature microscopes to track neural activity in freely behaving animals.*
- *Performed whole-brain tissue clearing and light-sheet microscopy to identify novel target for stress intervention. Developed image analysis pipeline.*
- *Utilized viral infusions and intracranial drug infusions to isolate brain plasticity for stress-induced changes in fear/anxiety in mice (Pennington et al, 2023).*

2011-2018 **Doctoral Student, UCLA**

- *Published 10 papers (4 first author; 6 collaborative).*
- *Utilized pharmacological tools and transgenic mice to dissect impacts of opioid exposure on behavioral and biological stress responses.*
- *Developed tract tracing and microscopy analysis methods.*
- *Collaborated on multiple projects examining learning/memory deficits in the context of aging and addiction.*

Skills

Behavioral Neuroscience	• *13+ years of experience conducting systems neuroscience research uncovering biological basis for psychiatric conditions* • *Rodent stereotaxic surgery, viral delivery, calcium imaging, optogenetics, neuroanatomy, tissue clearing, behavioral analysis, immunohistochemistry* • *Behavioral assessment of fear/anxiety, learning/memory, cognition, drug reward.*
Programming/ Data Analysis	• *Skilled at Python, R, git, Excel, SPSS* • *Analyzed data on numerous published manuscripts* • *Published multiple open-source software packages, most notably, the behavioral tracking software ezTrack, cited >100 times since 2019.* • *Shared numerous algorithms for cell counting, EMG/EEG analysis, behavior tracking, and more, on my github.*
Statistics	• *Multiple regression, hierarchical linear models, generalized linear models*
Microscopy	• *Confocal and epi-fluorescent microscopy, light-sheet microscopy, in vivo single photon calcium imaging* • *Skilled in 2D/3D image analysis*
Management/ Leadership	• *Designed and oversaw multi-year neurobehavioral research projects* • *Trained and managed multiple lab technicians, graduate students, and undergraduates, and guided them to their next career stage* • *Served as chair of postdoc association, spearheading multiple initiatives for trainee development. Developed and organized multi-lab journal club*
Communication	• *Instructed numerous courses for graduate/undergrad students* • *Taught several international technology workshops* • *Presented at professional conferences* • *Worked on collaborative multi-lab projects*
Science Writing	• *Have written/co-written multiple funded grants, several >$1,000,000* • *Published >20 papers*

Awards & Honors

2023-2028	National Institutes of Mental Health Pathway to Independence Award ($999,000)
2023-2025	Behavior & Brain Research Foundation, Young Investigator Award ($70,000)
2022	Mount Sinai Neuroscience Outstanding Citizen Award ($1,000)
2022	McKnight Foundation Doupe Fellow
2018-2019	National Institute on Drug Abuse T32 Postdoc Fellowship ($60,000)
2017	UCLA Teaching Practicum Program Fellow ($4,000)
2017-2018	UCLA Dissertation Year Fellowship ($20,000)
2015-2017	National Institutes of Mental Health Predoctoral Fellowship ($69,000)
2012-2014	National Institute on Drug Abuse T32 Predoctoral Fellowship ($60,000)

2008 Valedictorian of Pasadena City College

Professional Leadership & Service

2021-present Founder/Organizer, Sinai Anxiety Fear and Trauma Journal Club

Created multi-lab journal club to facilitate collaboration amongst labs and safe place for trainees to refine their science and presentation skills.

2021-2022 Chair, Mount Sinai Neuroscience Postdoctoral Association

Co-developed scholarship opportunity for scientists from underrepresented backgrounds, organized multiple career panels, created grant-writing resources for trainees, created job-search support group for trainees, and organized socials.

2019-present Instructor, Miniscope Workshops

Co-instructed several international workshops on the use of miniature microscope assembly, use, and data analysis to a diverse group of scientists.

Grants & Fellowships

Current Funding:

2023-2028 NIMH K99/R00 Pathway to Independence Award - $999,000

"Disentangling the consequences of trauma"

2023-2025 Behavior & Brain Research Foundation, Young Investigator Award - $70,000

"Contributions of the anterior hypothalamic nucleus to post-trauma stress sensitization"

2023-2025 NIMH R56 (Co-Investigator) – $783,000

"Fear and anxiety circuit mechanisms in anterior hypothalamic nucleus"

Teaching

2022-present Invited Lecturer at Icahn School of Medicine at Mount Sinai

2016-2017 Instructor at UCLA (Average Overall Rating: 8.4/9, N = 70)

2012-2018 Teaching Assistant at UCLA (Average Overall Rating: 8/9, N = 291)

Selected Publications:

For a full list of publications as well as pdf versions, please see: zachpenn.github.io.

Pennington ZT, LaBanca A, Sompolpong P, Christenson Wick Z, Feng Y, Dong Z, Francisco TR, Chen L, Fulton SL, Maze I, Shuman T, Cai DJ (2023). Dissociable contributions of the amygdala and ventral hippocampus to stress-induced changes in defensive behavior. *BioRxiv, 2023.02.27.530077.* https://www.biorxiv.org/content/10.1101/2023.02.27.530077v2

Pennington ZT, Diego KS, Francisco TR, LaBanca AR, Lamsifer SI, Liobimova O, Shuman T, Cai DJ (2021). ezTrack – A step by step by step guide to behavior tracking. *Current Protocols in Neuroscience*, 1(10): e255.

Pennington ZT, Trott JM, Rajbhandari AK, Li K, Walwyn WM, Evans CJ, Fanselow MS (2020). Chronic opioid pretreatment potentiates the sensitization of fear learning by trauma. *Neuropsychopharmacology,* 45(3): 482-490.

Pennington ZT, Dong Z, Feng Y, Vetere LM, Page-Harley L, Shuman T, Cai DJ (*2019*). ezTrack: An open-source video analysis pipeline for the investigation of animal behavior. *Scientific Reports,* 9(1): 19979.

Kosarussavadi S*, **Pennington ZT***, Covel C, Schlinger BA (2017). Across sex and age: Learning and memory and patterns of avian hippocampal gene expression. *Behavioral Neuroscience, 131(6): 483-491.*

**Joint first authors*

Pennington ZT, Anderson AS, Fanselow MS (2017). The ventromedial prefrontal cortex in a model of traumatic stress: Fear inhibition or contextual processing? *Learning & Memory*, 24(9): 400-406.

Lichtenberg NT, **Pennington ZT**, Holley SM**,** Greenfield VY, Cepeda C, Levine MS, Wassum KM (2017). Basolateral amygdala to orbitofrontal cortex projections enable cue-triggered reward expectations. Journal of Neuroscience, 37(35): 8374-8384.