BIOGRAPHICAL SKETCH

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NAME: Mitchell D. Morningstar

eRA COMMONS USER NAME (credential, e.g., agency login): MDMORNIN

POSITION TITLE: Graduate Student; PhD Program in Addiction Neuroscience

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Indiana University, Bloomington, IN, USA	B.S.	05/2016	Neuroscience
Indiana University, Bloomington, IN, USA	B.A.	05/2016	Cognitive Science
Indiana University, Bloomington, IN, USA	Technician.	08/2017	Neuroscience
Indiana University-Purdue University Indianapolis (IUPUI), Indianapolis, IN, USA	PhD	05/2022 (Projected)	Neuroscience

A. Personal Statement

As a graduate student in IUPUI's Addiction Neuroscience program, my overall research goal is to integrate disparate levels of analyses into cohesive hypotheses surrounding cognition. Specifically, I am interested in the intersection of drugs of abuse with cognition and how they impact cognitive processes, such as decision making, in both the short and long term. To this end, I began my research training as an undergraduate in Dr. George Rebec's laboratory at Indiana University. This culminated in an Undergraduate Honor's Thesis project and the acquisition of several technical skills such as *in vivo* electrophysiology, animal models of psychopharmacology, and operant models. From there, I was hired as a Laboratory Technician in Dr. Laura Hurley's laboratory, also at IU Bloomington. During this time, I assisted in projects whose overarching goal was investigating the role of serotoninergic signaling in mouse social interactions using both voltametric and histological techniques. At present I am a graduate student in Dr. Christopher Lapish's lab at IUPUI. During the first few years of my graduate training I have collected several *in vivo* electrophysiology datasets from a diverse set of tasks and conditions such as delayed discounting. Additionally, I have assisted in validating DREADDs data for both excitatory and inhibitory viruses *in vivo* allowing us to observe respective increases and decreases in neural activity. Additionally, I have aided in the design of our lab's automatic spikesorting pipelines and am at present refining skills associated with the development and deployment of computational models such as spiking neural networks and state-space analyses.

Given my extensive experience with awake-behaving electrophysiology recordings and familiarity with chemogenetic techniques, I will perform the data acquisition for this project. Additionally, I will preprocess all collected data such that they are suitable for the recovery of system dynamics during decision-making epochs. I have specific experience in awake-behaving electrophysiology recordings during delayed-discounting and after chemogenetic manipulation which will allow a straightforward transition in combining the two techniques.

B. Positions and Honors

Research Positions

Aug 2017 – Present Graduate Student Researcher, IUPUI
Aug 2016 – Aug 2017 Laboratory Technician, Indiana University
Jan 2013 – May 2016 Undergraduate Research Assistant, Indiana University

Teaching Positions

Spring 2019	Graduate Student Instructor, Statistics Laboratory, IUPUI
Spring 2019	Graduate Teaching Assistant, Ethics and Diversity in Psychology, IUPUI
Spring 2018	Graduate Teaching Assistant, Capstone in Psychology, IUPUI
Fall 2017	Graduate Teaching Assistant, Capstone in Neuroscience, IUPUI
Spring 2015	Discussion Leader, Human Sexuality, IU

Honors and Awards

Jun 2019	Student Merit Award, Research Society on Alcoholism
May 2016	Honors in Neuroscience, IU Bloomington
Fall 2014 – Spr 2016	Executive Dean's List, IU Bloomington
May 2012	IU Excellence Scholarship, IU Bloomington

C. Contributions to Science

Complete List of Published Works in MyBibliography: (2 peer-reviewed journal articles, 1 under review):
https://www.ncbi.nlm.nih.gov/myncbi/mitchell.morningstar.1/bibliography/public/

1. Determining the Effects of Acute EtOH on mPFC Neural Activity: Despite alcohol use maintaining widespread usage, the specific mechanisms by which it alters cognitive behaviors remains aloof. The purpose of this series of research is to determine what acute ethanol (EtOH) may be doing to neural population dynamics in the medial prefrontal cortex (mPFC) and how that subsequently disrupts behavior. To this end, awake-behaving *in vivo* electrophysiology recordings were conducted and compared to anesthetized *in vivo* electrophysiology recordings. An initial publication[a] from this work shows that acute EtOH does not achieve its deleterious effects on cognition via simple reductions in firing rate, as is seen in anesthetized recordings. Rather, acute EtOH seems to disrupt firing rate variability at the level of both the population and individual neuron. Future work will explore the consequences of these results in both follow-up empirical studies as well as in theoretical computational models in order to both rigorously develop and test predictions.

Publications

a. **Morningstar, M.D.**, Linsenbardt, D.N. and Lapish, C.C. (2020), Ethanol Alters Variability, But Not Rate, of Firing in Medial Prefrontal Cortex Neurons of Awake-Behaving Rats. *Alcohol Clin Exp Res.* doi:10.1111/acer.14463

Abstracts

1. **M.D. Morningstar**, C.C. Lapish. (2020). Differential Effects of Ethanol on Neural Activity in Medial Prefrontal Cortex of Behaving Versus Anesthetized Rats. *Research Society for Alcoholism.*
2. **M.D. Morningstar**, C.C. Lapish. (2019). Impact of Acute Ethanol Injections on Medial Prefrontal Cortex Neural Activity. *Society for Neuroscience.*

2. Evaluation of mPFC Neural Population Encoding in Delayed Discounting: Deficits in delayed discounting are thought to be mediated by heightened impulsivity. Impulsivity has been found to be correlated with an increased propensity towards alcohol and substance use disorders. To this end, our lab has utilized a delayed discounting task to measure impulsivity and decision making and subsequently the neural population dynamics relevant for both. My role within this project thus far has been the collection of the *in vivo* electrophysiological data and pre-processing of neural spike-trains. The results thus far have shown a population-level encoding of prospection within our data that motivate both future analyses and experimentation.

Abstracts

1. S.M. White, E. De Falco, **M.D. Morningstar**, D.N. Linsenbardt, C.L. Czachowski, C. C. Lapish. (2020). Prospective Strategies in Dorsal Medial Prefrontal Cortex Population Activity of Wistar Rats During Delay Discounting. *Research Society for Alcoholism.*

2. E. de Falco, **M. Morningstar**, S. M. White, D. N. Linsenbardt, C. C. Lapish. (2019). Neural population activity in the rat medial prefrontal cortex underlying proactive behavior in a delay discounting task. *Society for Neuroscience.*

3. Investigation of Serotonergic Signaling in Mouse Social Behaviors: The inferior colliculus (IC) is a relevant brain region for the processing of auditory information in rodents including ultrasonic vocalizations (USVs) from conspecifics and intruders. Fluctuations in serotonin (5-HT) are observed within the IC during social interactions in mice. To this end, this line of research aimed to determine what the effects of social isolation were on 5-HT fiber density within the IC. My role within this project was the development and testing of new carbon fiber microelectrodes for voltammetry, managing laboratory equipment and supplies, as well as collecting, analyzing, and co-authoring a publication related to the histological data. We found that social isolation reduced the density of serotonergic fibers within the IC in female but not male mice that has potential implications for sexual dimorphisms found in mouse social behavior.

Publications

a. Keesom S.M., **Morningstar M.D**., Sandlain R, Wise B.M., Hurley L.M. (2018). Social isolation reduces serotonergic fiber density in the inferior colliculus of female, but not male, mice. *Brain Research.*

Abstracts

1. **Morningstar M.D.,** Keesom S.M., Hurley L.M. (2018). Sex Difference in Inferior Colliculus Serotonin Fibers in Response to Varying Social Housing Conditions. *Animal Behavior Conference.*

4. Serotonergic Treatments for Cocaine Abuse: As an undergraduate researcher, my honors thesis work revolved around utilizing serotonergic treatments for drugs of abuse. Specifically, we utilized 2,5-Dimethoxy-4-iodoamphetamine (DOI), a 5-HT_{2A} and 5-HT_{2C} agonist, to reduce the expression of cocaine-induced conditioned place preference (CPP). Additionally, we investigated the effects of DOI on novel object recognition. We found that DOI reduced rodents' ability to recognize a novel versus familiar object as well as the expression of CPP. Whether these deficits emerged as a result of learning, perceptual or motor processes remains unresolved. My role within this project was the conceptualization, collection and analysis of data, and writing.

Abstracts

1. **Morningstar, M.D.**, Rebec, G.V. (2016). The Effects of the Hallucinogen DOI on the Novel Object Recognition Task and Conditioned Place Preference Within the Rat Model. *Indiana University Honors Thesis Banquet and Poster Session.*

D. Research Support

NIAAA Training Grant: Training Grant on the Genetic Aspects of Alcoholism
Role: Trainee Type: T32 AA007462
Period: 08/2019 - Present