



Nyhus Lab Manual

This lab manual provides important information for students doing independent study, honors, and/or summer research in the Nyhus Lab. I expect you to follow all lab procedures as laid out in this document. Please read it carefully and let me know if you have any questions or if there is anything I should add/edit.

Expectations and Responsibilities

My Role

To create an inclusive lab community where everyone's contributions are valued and we all help and support each other. As a woman cognitive neuroscientist and first-generation college student I aim to support women and historically excluded students in my lab. I support students in the lab by making expectations explicit in the lab manual, allowing flexibility by encouraging students to work on the area of research that is most interesting to them, making sure that everyone is given the opportunity to participate equally in the lab and in lab meetings, acting as an ally, and modeling inclusivity in the lab. After reading the lab manual, please meet with me to discuss how I can most effectively support you.

To give you the opportunity to participate in research. I will help you design your experiment, train you in the techniques used in the laboratory, and train you and provide feedback on effective presentation of research. I can also help you identify and approach additional mentors to assist you with your research.

Support you and your career goals. If you are struggling or if any issues arise in the lab, please come see me. There are many resources at Bowdoin to support your mental and physical wellness (see additional resources below). I am happy to discuss graduate school, research opportunities after graduation, and fellowships, provide feedback on applications, and write you letters of recommendation. There are many resources at Bowdoin to support your career goals (see additional resources below). To request a letter of recommendation please go to <http://goo.gl/forms/HhXswv17> and send me your unofficial transcript.

Your Role

Contribute to an inclusive lab community where everyone's contributions are valued and help and support each other.

To actively engage in the research. Depending on the research project that you are involved in you may assist with experimental design, run behavioral subjects, run EEG subjects, run tACS subjects, analyze behavior and/or EEG data, present your research (as a talk and/or poster), write a paper on your project, and attend regular lab meetings. Once you have gained experience in the lab, I expect you to become more independent in guiding the direction that your research takes and eventually taking on a leadership role and mentoring other students in the lab.

Be respectful of the lab and your lab mates. Please keep the lab space tidy, turn off and put away your cell phone, and if you must use a laptop please turn off your wifi for any lab activities and lab meetings. Please be quiet in the lab and shared research space. We are all extremely busy. Please respect everyone's time by being on time, meeting deadlines, taking notes during meetings, and never share a first draft. Plan well ahead of time and practice, reread, spell check, and revise any abstracts, talks, posters, and papers before presenting them to the lab or sending them to me for feedback. I generally need about a week to provide feedback and you will need time to revise, so plan accordingly.

I have found that the most successful researchers think critically, act ethically, work hard, and are extremely organized and detail oriented. This is an opportunity to practice these skills. But nobody is perfect, if you make a mistake it is important to notify me and we can work together to resolve it. Learning from your mistakes is important for becoming a scientist.

You are responsible for reading, understanding and following the Bowdoin Academic Honor and Social Code as printed in your Student Handbook (<https://www.bowdoin.edu/dean-of-students/student-handbook/the-academic-honor-code-and-social-code.html>).

Lab Resources

I will give you access to all lab resources.

Lab: Kanbar 008 is in the basement of Kanbar Hall and has two EEG systems as well as computers for data collection and analysis.

Shared student research space: Kanbar 310 is on the third floor of Kanbar Hall and is available for use by all student researchers in Psychology.

Lab meeting rooms: My office, Kanbar 220, is on the second floor of Kanbar Hall where we will have individual meetings. Kanbar 200 is on the second floor of Kanbar Hall and has a seminar table and projector for lab meetings.

Psychology Office: Kanbar 202 is on the second floor of Kanbar Hall and has a printer/photocopier (KanbarHall-Room 202), and fax machine for lab forms.

Copy and Print Center: The Copy and Print Center is in the Mail Center on the first floor of Smith Union and has a large format printer for printing posters (<https://www.bowdoin.edu/campus-services/copy-print-center/index.html>).

Bowdoin Library: The library should have all the books and access to all the journal articles you will need for your research. Please contact Sue O'Dell (sodell@bowdoin.edu) for any library questions.

Sona System: Sona systems is for running subjects in the PSYC 1001 subject pool. If you are running subjects in the PSYCH 1001 subjects pool, please see Donna Trout in Kanbar Hall 201 to get access to the Sona system (<https://bowdoin.sona-systems.com/>).

Google calendar: The Nyhus Lab Google calendar is for scheduling subjects. Please enter all scheduled subjects in the Google calendar.

Wiki: The Nyhus Lab wiki (<https://sites.google.com/site/nyhuslabwiki/>) is where you can find information and relevant papers. This is also a space for lab members to share any useful information. Before contacting anyone please check here first or Google it to see if there is already an answer to your question.

Slack: The Nyhus Lab Slack (nyhuslab.slack.com) is where you can communicate with myself and other students working in the lab. Please post questions here first before emailing me. I will not answer computer programming questions via email. If you have a computer programming question, please post it to Slack or come see me.

Server: The Nyhus_lab research space on the Microwave server is where the data is stored. Please keep the data up to date and well organized.

HPC Cluster: The HPC cluster (<https://www.bowdoin.edu/it/resources/high-performance-computing.html>) is for computationally intensive data analyses. Please contact DJ Merrill (deej@bowdoin.edu) to get access to the HPC cluster.

Lab Schedule

Other than scheduled lab meetings and running subjects, you will be working independently or collaboratively with other lab members. If you are sick, please stay home. It does not matter to me when you work as long as you are making good progress on your research project. You are welcome to use the lab, the shared student research space, or anywhere else on campus to read papers and do analyses. I am generally in my office and available outside of my class times and meetings to assist you with your project. I am on campus and check email and Slack Monday-Friday 9am-5pm and generally respond within 24 hours and I expect the same from you. Work/life balance is important and I want to model this behavior! I do not work in the evenings or on the weekends when I am with my family.

Background Training

Human Subjects Training

Understanding ethical issues regarding human research is critical for all cognitive neuroscientists. In order to do research in the Nyhus Lab, you will need to do training in the ethics of human research. Please go to the Institutional Review Board website (<https://www.bowdoin.edu/sponsored-research/research-integrity/irb/citi-training/index.html>) and follow the directions for creating a CITI account and complete the Social & Behavioral Research - Basic/Refresher. You do not need to do any additional modules. If you have already done the course, please log in to the CITI website and print out another copy of your certificate. Email me your completion report with all the modules completed ([see my completion report](#)). If you will be working with the tACS equipment you will also need First Aid and CPR training (<https://www.bowdoin.edu/hr/health-and-wellness/cpr-aed-training.html>).

Background Reading

In addition to my review paper on oscillations in memory ([Nyhus & Curran, 2010](#)). I would recommend reading a few books on oscillations. Sync: How Order Emerges from Chaos in the Universe, Nature, and Daily Life gives a general overview on oscillatory behavior in nature (from fireflies to neurons), Rhythms of the Brain discusses oscillations in the brain, and Event-related Potentials: A Methods Handbook which covers oscillation analysis in chapter 11. It looks like all of them are available at the Bowdoin library. If you will be working on a grant funded project, you should contact me to read the grant.

ERP Analysis

If you are unfamiliar with ERP analysis or need a refresher, please complete this free online course on ERPs (<https://courses.erpinfo.org/courses/Intro-to-ERPs>).

EEG Analysis

Before we get started on the data analysis, it would be good for you to learn some basic computer programming with Matlab and the EEGLab tutorial. Please complete this free online course on programming with Matlab (<https://www.coursera.org/learn/matlab>) (other good resources on programming with Matlab are <https://matlabacademy.mathworks.com/details/matlab-onramp/gettingstarted>, https://en.wikibooks.org/wiki/MATLAB_Programming or MATLAB for Behavioral Scientists available at the Bowdoin library), the online tutorial for EEGLab (<https://eeglab.org/tutorials/>), and the ICALabel tutorial (<https://labeling.ucsd.edu/tutorial/about>).

Running a Subject

You must follow the IRB protocol for each study, including using approved recruitment materials, informed consents, reading the instructions as written, EEG checklist, and run logs. Act professionally, treat your subjects with respect, and let me know if anything goes wrong during a session. If there are any issues during analysis we need the information in the run logs to determine what happened during the session. Make sure to put any session notes and impedences on each and every run log. If you are paying subjects for your study, I will help you set up a petty cash account at the Controller's Office and you will need to keep track of the money and make sure that subjects sign for payment. Please let me know when we are getting low on any lab supplies (e.g. gel, syringes) or if towels need to be washed. It usually takes about a week for supplies to arrive.

Please make sure to tidy up anything you take out in the lab, including any paperwork and lab setup equipment. Please keep all lab forms and payments organized in case we are ever audited. The signed informed consents and run logs should be organized in to separate folders and ordered by date.

Data Management

EEG data is big data and in order for your results to be reproducible it is very important to follow data file naming conventions, keep the data well organized, and thoroughly document your analysis steps. Please back-up and follow the data organization structure on the Nyhus_lab Microwave, double check, and comment your analysis scripts and save them on the Nyhus_lab Microwave. Myself and other students in future years should be able to find your files, understand, and replicate what you did!

Funding

The lab is supported by Bowdoin and the NIH. We should have all the equipment and supplies you need for working in the lab, but if you need to buy something or pay conference fees, you do not have to use your own money. Please contact me and I can pay for it with my Bowdoin credit card.

Additional Resources

Graduate School and Research Opportunities

Alumni and research opportunities: <https://www.bowdoin.edu/cxd/>

Research opportunities after graduation: <http://psychjobsearch.wikidot.com/2022predocs>

Applying to medical school: <https://www.bowdoin.edu/health-professions/index.html>

Additional EEG training: <https://pursue.richmond.edu/links/>

Funding

Emergency funding for students: <https://www.bowdoin.edu/dean-of-students/resources/emergency-funding/>

Research fellowships and grant writing: <https://www.bowdoin.edu/student-fellowships/index.html>

NSF graduate research fellowship: <https://www.alexhunterlang.com/nsf-fellowship>

Mental and Physical Wellness

Study habits, quantitative, writing, and time management support: <https://www.bowdoin.edu/baldwin-center/index.html>

Mental and physical health: <https://www.bowdoin.edu/counseling/>

Additional information specific to doing an independent study, honors project, or summer research can be found below.

Independent Study

To do an independent study you will need to fill out the registrar's form (<https://www.bowdoin.edu/registrar/students/course-registration/independent-study.html>) by the end of add/drop II. An independent study is taken as a course and therefore the expectation is that you put in as much time as you would for any other course (~ 10 hours per week). This may vary from week to week depending on what you are working on and if deadlines are approaching. We will meet weekly individually or in a group depending on your project for ~30 minutes to discuss what you have done the previous week and what you plan to do the following week as well as to answer any questions you may have. I prefer to meet on Mondays. Please come see me the first week of classes to arrange a time to meet. If you need to reschedule or

cancel a meeting please let me know in advance. In addition to your research responsibilities, I also expect you to participate in additional research activities including attending research seminars in psychology and biology (<https://www.bowdoin.edu/biology/news/seminar-series/index.html>).

Check-in

We will do a mid-semester check in to make sure you are on track with your independent study project ([see questions here](#)).

Final Paper

Regardless of whether you are focusing on a literature review, running subjects, or doing data analysis for your independent study, I expect you to understand the background and rationale for the research. Therefore, in addition to your lab duties, you should be reading papers relevant to your project (2-3 per week). Many papers are posted on the lab wiki that cite other relevant papers or you can search for relevant papers online. At the end of the semester, you will be evaluated on your independent study with a final paper (~10 pages) that may take the form of a literature review, empirical paper, or research proposal depending on your independent study project. For example, if your independent study project was a literature review you should write your final draft of the literature review as your final paper. If your independent study project was running subjects and/or doing data analysis you should write an introduction, the current methods, preliminary results, and future directions of the project as your final paper.

You will be graded on your independent study based on time and effort, understanding and engagement with the project, and final paper.

Honors Project

To do an honors project you will need to fill out the registrar's form (<https://www.bowdoin.edu/registrar/students/course-registration/honors-projects.html>) by the end of add/drop II. An honors project is taken as a course and therefore the expectation is that you put in as much time as you would for any other course (~ 10 hours per week). This may vary from week to week depending on what you are working on and if deadlines are approaching. We will meet weekly individually for ~30 minutes to discuss what you have done the previous week and what you plan to do the following week as well as to answer any questions you may have. I prefer to meet on Mondays. Please come see me the first week of classes to arrange a time to meet. If you need to reschedule or cancel a meeting please let me know in advance. In addition to your research responsibilities, I also expect you to participate in additional research activities including attending research seminars in psychology and biology (<https://www.bowdoin.edu/biology/news/seminar-series/index.html>), attending lunches with the speakers, and attending job talks.

Check-in

We will do a mid-semester and mid-year check-in to make sure you are on track with your honors project ([see questions here](#)).

Honors Presentations

You will be required to give a talk in December and May on your honors project. The dates for the talks will be posted on the Neuroscience website (<https://www.bowdoin.edu/neuroscience/requirements/honors-indep.html>). Remember who your audience is (Neuroscience faculty and majors) when you are preparing your presentation. You should use your presentation from the summer and/or fall as the basis for future presentations. You will do a practice talk for the lab the week prior to the presentation to get feedback. I also encourage you to do a practice talk with your peers.

Honors Paper

You will be required to write an honors paper for your honors project. Examples of completed honors projects can be found on the library website (<https://digitalcommons.bowdoin.edu/honorsprojects/>). You should read some of the completed honors projects in Neuroscience to get an idea of what is expected for your honors paper. You will be required to turn in a draft of your honors paper in the fall semester and a final paper in the spring semester. In the fall semester you are expected to have a well-developed literature review and introduction, methods, and preliminary results and discussion. In the spring semester you are expected to have revised your introduction and finalized your methods, results, and discussion. In addition to your lab duties, you should be reading papers relevant to your project and working on your paper throughout the summer and/or semester. Please follow deadlines from the Neuroscience program (<https://www.bowdoin.edu/neuroscience/requirements/honors-indep.html>) and the library (<https://bowdoin.libguides.com/honors>). Please read all emails and follow all library guidelines for formatting ([see Leigh's paper for an example](#)). I also recommend using EndNote or another citation management software for citing papers. The library has useful information on citation management tools (<https://bowdoin.libguides.com/citationmanagement>). In order for me to provide feedback, please email me your paper as a .docx so I can insert comments. I try to provide feedback within 5 weekdays of receipt of an honors paper so you have time to revise.

You will be graded on your honors project each semester based on the time and effort, understanding and engagement with the project, the presentation, and paper.

Summer Research

Your summer fellowship includes a stipend and summer housing on campus. If you are funded by an NIH grant you will have to fill out and submit timesheets in Workday for approval every two weeks. You will have to apply for summer housing and interim housing if you need to stay on campus before or after your fellowship through the Office of Events and Summer Programming (<https://www.bowdoin.edu/events/summer-programs/housing.html>). I prefer all students to work the same 8 weeks, June-July, which we will coordinate once fellowships are awarded. Your summer fellowship requires that you work ~40 hours per week. We will have weekly meetings/journal clubs where you will share what you been working on, get input on any hurdles you are facing, and share your plans for future directions in your research. We will also read and discuss papers relevant to your research project and practice giving research presentations. In addition to discussing research papers in lab meetings, we will also discuss two papers on the importance of diversity in cognitive neuroscience. We will each present on a rotating basis. Everyone should read the papers each week, even if they are not presenting, and contribute actively to the discussion. I prefer to meet on Mondays. Please come see me the first

day of your summer research to arrange a time to meet. In addition to your research responsibilities, I also expect you to participate in additional research activities including the welcome session for summer research students, training, and discussing your research with other summer biological research fellowship students. You will not be required to do the lab safety training as it is not necessary for our research.

Additional Background Training for Federally Funded Research

In addition to completing Bowdoin's IRB Social & Behavioral course, if your summer research is funded by an NIH grant you will need to complete the Responsible and Ethical conduct of Research training and send your completion certificate to me and cc Laura Pilgrim (l.pilgrim@bowdoin.edu).

Presentations

You will be required to give a talk at some point in July on the research you will be doing in the lab at the summer biological sciences summer fellowship presentations. You can present individually or as a group. Remember who your audience is (Neuroscience and Biology faculty and students) when you are preparing your presentation. You will do a practice talk for the lab the week prior to the presentation to get feedback. I also encourage you to do a practice talk for your peers.

Students participating in summer research will also present their research at the annual President's Summer Research Symposium in the fall. You can present individually or as a group. Please follow the directions about abstract submission and poster printing emailed to you by Mike Danahy. Please see this website (<https://colinpurrington.com/tips/poster-design/>) about making a poster and attached template ([see template](#)). Please email me your abstract and poster draft at least a week prior to the deadline to get feedback.

You are also encouraged to present your research at the Faculty for Undergraduate Neuroscience (FUN) (<https://www.funfaculty.org/postersession>), Society for Neuroscience (SFN) (<https://www.sfn.org/meetings>), or the Cognitive Neuroscience Society (CNS) (<https://www.cogneurosociety.org/annual-meeting/>) annual meeting. This will give you an opportunity to practice presenting your research and an excellent opportunity for networking and making connections prior to applying to graduate school. This opportunity is important for you to gain exposure to the broader field of cognitive neuroscience, to receive feedback from other researchers, and to identify potential research areas and mentors for graduate training. If you presented at the President's Summer Research Symposium you should use the same poster, but the size requirements are different (see FUN, SFN, and CNS requirements). Please email me your abstract and poster draft at least a week prior to the deadline to get feedback. There are Bowdoin funds as well as lab funds for students to attend a conference. I can help you become a society member, submit your abstract, register for the conference and pay conference fees. At the conference you are representing yourself, me, the lab, and Bowdoin and you should attend the talks and poster sessions, dress, and act professionally.

Final Report

You will be required to submit a two-page final report to Gina Pappas (gpappas@bowdoin.edu) at the end of the summer. Examples of final reports from previous summer research students can

be found on the Student Fellowships and Research website (<https://www.bowdoin.edu/student-fellowships/recent-winners/bowdoin-funded/2021-2022.html>). You should read some of the final reports in Neuroscience to get an idea of what is expected for your final report. Your final report should explain the background and research rather than what you did in the summer. You should follow the template posted on the Student Fellowships and Research website for formatting (<https://www.bowdoin.edu/student-fellowships/summer-fellowships/final-report-information.html>). Each student must write their own final report regardless of whether they were working on a project together. In order for me to provide feedback, please email me your report as a .docx so I can insert comments at least a week prior to the deadline.

You are also encouraged to be a co-author on any published papers that result from your research. In order to be considered for co-authorship, I expect you to contribute substantially to the project and work with me to write the paper. To continue our collaboration and to co-author papers, please provide me your permanent email address before you graduate.

Acknowledgements

Thank you to the Aly Lab, Columbia University and the Chrastil Lab, University of California, Irvine for the example lab manuals.