Behavioral Neuroscience Research Course Manual

Compulsive-like (left) and non-compulsive like (right) OCD mice

BIOL 043 (non-credit)/BIOL 194 (1 credit)
University of Alaska Fairbanks
Fall 2016
Abel Bult-Ito
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Part I: Syllabus

1. Catalog Description

  BIOL 043 MORE Behavioral Neuroscience Research (0 credits)
  BIOL 194 Behavioral Neuroscience Research (1 credit)

Online biomedical research on compulsive-like mice, including data collection, data analysis, and interpretation of results. Learn about obsessive-compulsive disorder (OCD) in humans and how animal research has the potential to contribute to improving the human
condition. May not be used as a biology elective credit for a major in biological sciences. Special fees apply. Only available via eLearning and Distance Education. (0.5+1.5)

2. Detailed Description of Behavioral Neuroscience Research

Welcome to Behavioral Neuroscience Research, a fully online research course! During this semester you will participate in biomedical research on mice, including data collection, data analysis, and interpretation of results. In collaboration with the other students in the course, you will choose a novel experiment that is scientifically justified, humane and ethical. You will learn about obsessive-compulsive disorder (OCD) and other conditions in humans and how basic animal research has the potential to contribute to improving the human condition. This will be an excellent opportunity for you to explore your interests in biology, and biomedical research specifically.

Course Goals:
To offer a comprehensive undergraduate biomedical research experience to online students from Alaska, the US, and around the world that is an equivalent experience to students who work in the physical research laboratory and to expose students to the scientific research method with hands-on research activities.

Course Learning Objectives:

1. Complete IACUC training.
2. Discuss how research on animals must be scientifically justified, humane and ethical, and provide new knowledge.
3. Perform biomedical behavioral neuroscience research entirely online.
4. Collect behavioral data from mouse videos from compulsive-like, non-compulsive-like, and randomly bred mouse strains.
5. Analyze data for each behavior collected by students.
6. Interpret and discuss results in the context of other published research.
7. Describe the key characteristics of obsessive-compulsive disorder (OCD), anxiety, and depression in humans.
8. Compare and contrast compulsive-like, anxiety-like, and depression-like behaviors in mice to equivalent conditions in humans.
9. Formulate original research hypotheses.
10. Describe and discuss as to how basic research, as performed in this course, contributes to the animal model of OCD and how it may have the potential to contribute to improving the human condition.

The OCD Mouse model you will be using:
The compulsive-like mouse model was developed from mouse strains artificially selected for high levels of nest-building behavior (compulsive-like big nest-builders; BIG1 and BIG3), low levels of nest-building behavior (non-compulsive-like small nest-builders; SMALL1 and SMALL3), and randomly-bred control mice (CONT1 and CONT3), with intermediate nest-building levels (Bult and Lynch, 2000). These mice show face and predictive validity for a compulsive-like phenotype, using behavioral assessments and pharmacological treatments (Greene-Schloesser et al., 2011).
References:

We will use a variety of approaches to accomplish the learning objectives:
1. Content Modules (about 9 hours). We will discuss the format of the course, what you get out of the course, what is expected of you, and the ethics of using mice in research. In addition, we will discuss the background on the four mouse behaviors you will be researching and how these behaviors relate to obsessive-compulsive disorder (OCD), anxiety, and depression in humans.

2. Laboratory training, data analysis, and data interpretation modules, Institution Animal Care and Use Committee (IACUC) training, and discussion boards (about 10 hours). During these modules, you will receive detailed information on how the behavioral data of the OCD mice was obtained and how you are to collect your own data set using these behavioral videos, and how to analyze and interpret the data. In addition, you will learn about the ethical use of mice in research and how to handle the animals. You will also be asked to contribute to discussion boards related to the course content.

You are required to successfully complete IACUC training during the first two weeks of the course. You will be withdrawn from the course if you have not completed this training by the end of
the third week, i.e., by 11:59pm Alaska standard time on Friday 9 September 2016.

3. **Collection of behavioral neuroscience research data (about 20 hours).** For each behavior, 11-16 mice from each of six mouse lines will be individually videotaped. You will be assigned a subset of these mice to collect your own dataset. For each of four behaviors, you will spend about 5 hours to collect and analyze the data. The entire dataset from all students including all mice and four behaviors will also be made available to you. Please be advised that you may be collecting several behavioral components for each behavior.

4. **Provide course feedback (about 1 hour).** You will be asked to choose a novel behavioral neuroscience experiment in collaboration with the other students in the course. You will be asked to choose what type of experimental manipulation to conduct and what behavior(s) of the OCD mice to test. This may include treatment with a drug and/or selection of which OCD mouse lines to use. The instructor will perform this experiment and videotape the procedures and the mice, so you can collect and analyze the data of this novel experiment. You will also be asked to provide a student opinion of instruction of the course, so we can improve it for future offerings.

This manual will act as your guide for this course. In it is a description of the course requirements, module topics, and reading assignments, as well as general information to help you get the most out of this course. You should refer to it regularly throughout the semester.

Your minimal responsibilities for this course are defined in the Course Requirements section below. Be aware, however, that your successful completion of the course activities depends on how well you integrate
all of the different kinds of information you receive from content modules, trainings, reading assignments, and data collection, analysis, and interpretation activities. Therefore, do not think of those assignments as separate entities but rather as parts of a jigsaw puzzle; together the complete concepts emerge.

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Course Meeting Times and Locations
Content modules, laboratory trainings, and data sets will be available online. Generally, these will be made available on Monday 9am Alaska standard time and activities need to be completed by Friday 5:00pm (17:00) Alaska standard time.

Course Sections
BIOL 043; UX1; CRN 75330; No prerequisites.

BIOL 194; UX1; CRN 77825; Prerequisite: High school diploma, junior or senior standing in high school with a cumulative and science GPA of at least 3.0 with biology and chemistry course grades of at least 3.0, or permission by instructor. May not be used as a biology elective credit for a major in biological sciences. Special fees apply.
You will be doing essentially the same work, whether you are enrolled in BIOL 043 or BIOL 194.

**Disabilities Services**
The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will closely work with the Office of Disabilities Services (208 Whitaker Building, 474-5655 or TTY at 474-1827; email: uaf-disabilityservices@alaska.edu) to provide reasonable accommodation to students with disabilities.

To ensure that everyone has equal opportunities to succeed in this course, please let me know if I need to accommodate any disabilities that you may have with assistance of Disability Services. Any information you provide will be held strictly confidential.

**Support Services**
Computer labs on the UAF main campus are available in 303 Irving I (please contact Biology and Wildlife Office to get access), MBS complex room 110, 319 Bunnell Building, and Rasmuson Library 404. You may be eligible for services from the Student Support Services, 514 Gruening Building, Phone: 474-6844, E-mail: trio.sss@alaska.edu, [http://www.uaf.edu/sss/](http://www.uaf.edu/sss/).

**Accessibility and Privacy**
Details on the accessibility and privacy statements for technologies used in this course can be found at:

- **Canvas**: [Accessibility Information](http://canvas.uaf.edu/accessibility.xhtml) and Privacy Policy
- **Google**: [Accessibility Information](http://www.google.com/accessibility.html) and Privacy Policy
- **YouTube**: [Accessibility Information](http://www.youtube.com/accessibility.html) and Privacy Policy
3. Course Requirements

To do well in this course you must watch and participate in all course activities. Your grade will be based on the following criteria:

1. Watch Content Modules 10%
2. Watch Laboratory Training Modules 10%
3. Watch Data Analysis Modules 10%
4. Watch Data Interpretations modules 5%
5. Collect Data 50%
6. Participate on Discussion Boards 10%
7. Choosing Novel Experiment 2.5%
8. Complete Course Evaluation 2.5%

Total: 100%

Watch Content Modules
Whether you watch the content modules will be monitored by the Canvas Network course management system and evaluated with short online quizzes. You cannot move forward to the next module without watching the video in its entirety and completing the quizzes for each content module correctly.

Watch Laboratory Training Modules
Whether you watch the laboratory and training modules will be monitored by the Canvas Network course management system and evaluated with short online quizzes. You cannot move forward to the next module without watching the video in its entirety and completing the quizzes for each laboratory training module module correctly.

Watch Data Analysis Modules
Whether you watch the data analysis modules will be monitored by
the Canvas Network course management system and evaluated with short online quizzes. You cannot move forward to the next module without watching the video in its entirety and completing the quizzes for each data analysis module module correctly.

**Watch Data Interpretation Modules**
Whether you watch the data interpretation modules will be monitored by the Canvas Network course management system and evaluated with short online quizzes. You cannot move forward to the next module without watching the video in its entirety and completing the quizzes for each data interpretation module module correctly.

**Collect Data**
Because this is a laboratory course, data collection comprises 50% of your final grade. Whether you watch the mouse videos will be monitored by the Canvas network course management system. You cannot move forward to the next module without watching each of the assigned mouse videos and uploading the data in the appropriate spreadsheet.

For each behavior, you will collect data of about 22 animals randomly distributed among the six mouse strains. This will result in 22 data points for each behavioral component. For some behaviors, you will collect data on several different components. To get credit for data collection for each behavior, 90% of your data points need to be within an acceptable range, which will be defined for each behavior.

**Participate on Discussion Boards**
Your active participation in this course is expected. For each behavior, we will have at least one discussion board to which you are expected to contribute constructively. To receive credit for this activity, you should have contributed constructively to 80% of the discussion boards.
Choosing a Novel Experiment
The instructor will design two novel experiments from which the students taking the course will choose one. Each experiment will have received IACUC approval before the start of the semester. Whether you contribute to choosing the novel experiment on the OCD mice will be monitored by the Canvas Network course management system. To receive credit (2.5%), you will have to complete the online survey(s) related to this activity.

Complete the Course Evaluation (Blue evaluation)
Receiving your feedback on the course is very important for improving the course for future offerings. Your feedback will be anonymous and only provided to the instructor after the grades have been posted. Please be advised that completion of the evaluation is mandatory, as you will not receive a grade if you do not complete it within one week of the end of the course.

Additional Activities
You are encouraged to read the suggested reading materials. You can also do your own literature research and learn more about the topics discussed in this course. Good sources for peer-reviewed literature include PubMed Central (http://www.ncbi.nlm.nih.gov/pmc/) and Web of Science/Knowledge (http://apps.webofknowledge.com).

Grading
The course will be graded on a straight percentage basis:
● 70% or more of the activities completed successfully is Pass.
  o BIOL 043: Certificate of Completion
  o BIOL 194: 1 UAF credit
● Less than 70% of the activities completed successfully is Fail.
Part II: General Course Information

4. Outline of Content Modules, Laboratory Trainings, and Data Collections
(Subject to Change)

<table>
<thead>
<tr>
<th>Week of the Semester</th>
<th>Content Modules/Laboratory Trainings: Topics</th>
<th>Data Collections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Module 0: Format of the course; student expectations</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Module 1: IACUC Training</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Module 2: The ethics of using mice in research</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Module 3: Scientific background on OCD in humans and compulsive-like behavior in mice; nest-building data presentation</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Module 4: Laboratory training session 1: Marble burying test (compulsive-like behavior) and Data collection 1</td>
<td>Marble burying test</td>
</tr>
<tr>
<td>5</td>
<td>Module 5: Data analysis session 1: Marble burying behavior</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Module 6: Scientific background on anxiety behaviors in humans and mice</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Module 7: Laboratory training session 2: Open field test (anxiety) and Data collection 2</td>
<td>Open field test</td>
</tr>
<tr>
<td>8</td>
<td>Module 8: Data analysis session 2: Open field behavior</td>
<td>-</td>
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<tr>
<td>9</td>
<td>Module 9: Scientific background on depression behaviors in humans and mice</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Module 10: Students choose one behavioral experiment from three possible experiments designed by the instructor Module 11: Laboratory training 3: Tail suspension test (depression) and Data collection 3</td>
<td>Tail suspension test.</td>
</tr>
<tr>
<td>11</td>
<td>Module 12: Data analysis session 3: Tail suspension test.</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>Module 13: Scientific background on the behavioral test chosen by the students Module 14: Laboratory training session and Data collection 4 for behavioral test chosen by the students</td>
<td>Behavior chosen by the students</td>
</tr>
<tr>
<td>13</td>
<td><em>Thanksgiving Break</em></td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Module 15: Data analysis session 4: Behavioral test chosen by the students</td>
<td>-</td>
</tr>
</tbody>
</table>
5. How to Get the Most Out of the Course

1. On average, you need to spend two-five hours per week on this course to be successful. Some weeks, you may only spend two hours on course activities, while other weeks this may be five hours.

2. Do the assigned readings before watching the content modules. This will help you understand the module material and see how a topic is going to be developed. Watching the modules prepared will also give you the necessary background to enjoy and absorb the content.

3. Establish a schedule of activities that includes some time set-aside for review. For example, as we discuss the results of the open field test, review the data analysis and interpretation of the marble-burying test, so you can put the new information into the proper context.

4. Don't be embarrassed or afraid to admit that you are having difficulty. We should all work together to see that everyone learns. Please contact me because I want this course to be a successful learning experience for everyone. I have office hours because I want to help you succeed; use me!

5. Ask questions. This is the best way you have for clearing up
confusing points and misunderstandings and to go beyond what we talked about in content modules and the laboratory. Learning to ask questions is the first skill that a scientist has to develop in order to find meaningful answers.

6. Have fun! Nothing works better than enjoying what you are doing. Please let me know at any time what I can do to improve the course.

6. Students' Rights and Responsibilities

The university subscribes to principles of due process and fair hearings as specified in the "Joint Statement on Rights and Freedoms of Students." This document can be found in the Division of Student Services. You are encouraged to read it carefully.

Most students adjust easily to the privileges and responsibilities of university citizenship. The university attempts to provide counsel for those who find the adjustment more difficult. UAF may terminate enrollment or take other necessary and appropriate action in cases where a student is unable or unwilling to assume the social responsibilities of citizenship in the university community.

STUDENT CODE OF CONDUCT

UAF students are subject to the Student Code of Conduct. In accordance with board of regents' policy 09.02.01, UAF will maintain an academic environment in which freedom to teach, conduct research, learn and administer the university is protected. Students will benefit from this environment by accepting responsibility for their role in the academic community. The principles of the student code are designed to encourage communication, foster academic integrity and defend freedoms of inquiry, discussion and expression across the
university community.

UAF requires students to conduct themselves honestly and responsibly, and to respect the rights of others. Conduct that unreasonably interferes with the learning environment or violates the rights of others is prohibited. Students and student organizations are responsible for ensuring that they and their guests comply with the code while on property owned or controlled by the university or at activities authorized by the university.

The university may initiate disciplinary action and impose disciplinary sanctions against any student or student organization found responsible for committing, attempting to commit or intentionally assisting in the commission of any of the following prohibited forms of conduct:

a. Cheating, plagiarism or other forms of academic dishonesty
b. Forgery, falsification, alteration or misuse of documents, funds or property
c. Damage or destruction of property
d. Theft of property or services
e. Harassment
f. Endangerment, assault or infliction of physical harm
g. Disruptive or obstructive actions
h. Misuse of firearms, explosives, weapons, dangerous devices or dangerous chemicals
i. Failure to comply with university directives
j. Misuse of alcohol or other intoxicants or drugs
k. Violation of published university policies, regulations, rules or procedures
l. Any other actions that result in unreasonable interference with the learning environment or the rights of others.
This list is not intended to define prohibited conduct in exhaustive terms, but rather offers examples as guidelines for acceptable and unacceptable behavior.

Honesty is a primary responsibility of you and every other UAF student. The following are common guidelines regarding academic integrity:

1. Students will not collaborate on any quizzes, in-class exams, or take-home exams that contribute to their grade in a course, unless the course instructor grants permission. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.
2. Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports.
3. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors.

Alleged violations of the Code of Conduct will be reviewed in accordance with procedures specified in regents' policy, university regulations and UAF rules and procedures. For additional information and details about the Student Code of Conduct, contact the dean of students or visit [www.alaska.edu/bor/](http://www.alaska.edu/bor/).

**STUDENT BEHAVIORAL STANDARDS**
Education at the university is conceived as training for citizenship as well as for personal self-improvement and development. Generally, UAF behavioral regulations are designed to help you work efficiently in courses and live responsibly in the campus environment. They are not designed to ignore your individuality but rather to encourage you to exercise self-discipline and accept your social responsibility. These
regulations, in most instances, were developed jointly by staff and students. Contact the dean of students for more information.

NETIQUETTE
We are mutually interdependent in the success of our learning endeavor. I expect that we will all model the highest standards of respect and consideration for one another and for our learning process.

Please make sure that:

● Your contributions are regular and sufficiently engaging.
● Your contributions are insightful with deliberate contemplation evident.
● You contribute meaningfully to the discussion, and your comments demonstrate original thought and stimulate continued dialog.
● Your feedback is constructive and collegial.
● Your comments are widely distributed across the cohort.
● Your communications exhibit professionalism and respect.

Netiquette addresses civility and professionalism in online communications. Adhering to some basic guidelines further ensures the success of our communications and collective learning experience.

● Do not use offensive language.
● Do not dominate discussions.
● Use simple English.
● Use correct spelling and grammar.
● Share tips with other students.
● Keep an “open-mind” and be willing to express even your minority opinion.
● Think before you push the “Send” button.
● Do not hesitate to ask for feedback.
● When in doubt, always check with others for clarification.

7. Conditions You Agree To When Taking This Course
1. You agree that you will not make any course materials, including but not limited to content modules, data, data videos, etc., available to anyone else. Doing so will violate copyright law and will be prosecuted.
2. You agree that you do not object to the use of the OCD mice in the experiments performed in this course.
3. You agree to waive any ownership rights to any of the data collected or findings in this course.
4. You agree to waive any rights to authorship related to any data or findings obtained during this course.
5. You agree that any findings related to the delivery of this course maybe be published. Neither your name nor any other personal data will be released in such publications.
6. High school students are encouraged to enroll to get an exciting first experience with college-level research that is scientifically cutting-edge. If less than 18 years of age, parental permission is required before enrollment is granted, you must be a junior or senior high school student, and have an overall and science high school GPA of at least 3.0 (or equivalent) with biology and chemistry course grades of at least a B (or equivalent).
7. You will be required to successfully complete online institutional animal care and use committee (IACUC) training before you are given access to the behavioral data videos. You will be withdrawn from the course if you have not completed this training by the end of the third week, i.e., by 11:59pm Alaska standard time on Friday 9 September 2016.