Neuroscience laboratory NROC63
University of Toronto Scarborough
Fall 2015

Wednesday 11am-2pm, SW316 (lecture) + SW148 (lab)
Instructor: Rutsuko Ito - Office hours: Thursday 1-3pm, SW627
TAs: David Nguyen (Groups A-C) - Office hours: Wednesday 5-6pm, SW625B
Laurie Hamel (Groups D-F)- Office hours: Wednesday 5-6pm, SW625B
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* *Your TAs are your first point of contact for any queries you have. You can also post course/content related questions to relevant blackboard discussion forum for the benefit of other students.*

Course Overview

The Neuroscience Laboratory course is an upper level course for the Neuroscience specialist program, designed to teach hands-on research techniques that are commonly used in behavioural/systems neuroscience, to students who will likely go on to post-graduate study in a neuroscience related field. The behavioural procedures have been carefully chosen to offer training in a wide variety of behavioural techniques ranging from the use of operant boxes (lever pressing for food), mazes (water maze, elevated plus maze) and other equipment (Open field), while minimizing discomfort to the animal subjects. Students will also acquire skills in the areas of research design, animal handling, data collection and analysis, literature review, critical thinking and research writing.

Important: This is a time-intensive laboratory course. Although there is a 3-hour time slot devoted to the course each week, students will be required to *devote extra time on multiple days to behavioural testing*. **It is absolutely critical that procedures are completed as scheduled and if you are unable to complete a planned procedure, it is your responsibility to contact other students in your group that can take your place.** In addition, the lab assignments will require the collection of independent data, which will be pooled with all members of the class. Failure to meet deadlines with regards to uploading data will have consequences on all members of the class. If you are negligent in any aspect of duties related to this course (experimental procedures, animal care), you will be suspended from the lab portion of the course immediately and this will have serious consequences for your participation mark and your final grade.

Course Objectives

By the end of the course:
- You will develop a working knowledge of relevant research literature
- You will have a working knowledge of how a research project in behavioural neuroscience is designed and conducted
- You will have had experience with behavioural techniques in neuroscience
- You will have developed some skills in critically evaluating a scientific paper

- You will have practiced writing a scientific manuscript

Tentative Course Outline

Date	Topic	Lab	Assignment
Sep 9	Course Introduction & Tour of lab **Literature Review Guidelines**		
Sep 16	Animal ethics lecture 11-12.30 (David Hanwell, University Vet)	Animal handling training with Kim Kovaczi (90min)	**Quiz at end of lecture (5%)**
Sep 23	**Animal models of brain disorders** Behavioural Techniques 1: Tests of incentive motivation	Sucrose Preference Test + Food restriction	**Assigned reading: Animal Use Protocol & Oliveras et al., 2015**
Sep 30	**Principles of Experimental Design** Behavioural Techniques 2: Tests of memory	Progressive Ratio Operant Task	
Oct 7	**Writing the Introduction & Methods** Behavioural Techniques 3: Tests of Anxiety and Locomotion	Repeated ketamine administration	**Literature review (15%) due Oct 11**
Oct 14	**Reading week – no class!**	Withdrawal period (7 days)	
Oct 21	**Review of behavioural procedures** **Discussion of Oliveras et al., 2015**	Elevated Plus maze + Sucrose preference Test	**Quiz at beginning of lecture (10%)**
Oct 28	**Class presentations – research proposal on pharmacological model of schizophrenia**	Progressive Ratio Schedule re-training	**Group Presentation (10%)**
Nov 4	**Stereotaxy**	Water maze Training -Data up to and including PR operant task MUST be uploaded by 6th Nov	
Nov 11	**Writing the Results**	Locomotor Test - All water maze and locomotor data must have been entered and uploaded by 13th Nov	**Introduction & Methods (15%) due 13th Nov**
Nov 18	**Writing the Discussion**	Brain extraction	**Data analysis assignment due (10%)20th Nov**
Nov 25	**Histological Methods**		
Dec 2	**No class!**		**Final paper due (25%)**

Resources: Lectures slides and PDFs of papers for assigned reading will be posted on the course website (in the "Content" section) *by midnight at the latest* the night before the lecture.

Enrolment: The animal ethics lecture with the University Veterinary Surgeon and handling training with the Veterinary Technician is a mandatory training requirement by the University for all students working with animals. *Students who have missed these components will not be able to enrol in the course at a later date.*

Scheduling conflict: A web option will not be offered for this course, so it would be your responsibility to ensure that you are able to attend all the lectures. ***We will not answer emails concerning scheduling conflict.***

Evaluation

There is no final exam for this course. Instead, grading will be based on the following categories of assignments.

1. Quizzes (15%)
Ethics Quiz (5%) – Sep 16th
Quiz on assigned readings: Animal Use Protocol & Oliveras et al., 2015(10%) – Oct 21st in class

2. Literature Review (25%)
Mini review (15%) – due Oct 11th
You will write a mini-review comparing the validity of two pharmacological models of schizophrenia (Ketamine and PCP, MK801 or Amphetamine). The review should be around 4-5 pages long, and should cover a literature review of the neurobiology and behavioural consequences of repeated ketamine and PCP, MK801 or Amphetamine. References must be drawn predominantly from animal research. Although discussions with your group are permitted, the minireviews should be written independently.
Group presentation of research proposal based on Literature Review (10%) – Oct 28th
You will prepare a group presentation (15min + 5min discussion time) in your groups of 4, which should include a discussion of the outcome of your literature review, identification of a gap in research, and a research proposal (animal research) that is novel and plausible.

3. Research Paper (45%)
Your final paper should be written according to the specific guidelines of the journal Neuropsychopharmacology:
 http://www.nature.com/npp/author_instructions.html#Preparation-of-manuscripts, and the manuscript we have prepared from my laboratory. Some brief guidelines are provided below, but you must read the detailed guidelines online.
Introduction & Methods (10%) – due Nov 13th
The Introduction should be below 750 words in length. A lengthy review of the topic is discouraged, and the introduction must contain a clear and concise background of the research and a rationale for the study.
The Methods section must contain a detailed description of the experimental procedures, and should not exceed 1500 words.
Data Analysis (10%) - due Nov 20th
You will run statistical analyses (using SPSS) on the data generated from the Progressive Ratio schedules of reinforcement, and write up a paragraph describing the analyses, as if you are writing the Results section. The feedback you will receive from this assignment will help you write the rest of the Results.
Final Paper (25%) – due Dec 3rd
The final paper should contain the following sections:
Title Page: This should contain the title of the paper (please be creative!), your name, and word counts for the Abstract, Introduction, Methods and Discussion, as well as the number of text pages and Figures (max 5).
Abstract: should clearly state the background, rationale, brief procedures and results of the paper, and should not exceed 250 words.
Introduction: as above
Materials and Methods: as above
Results: This section should report statistical analyses of all the data collected.

Discussion: This section should have an in depth discussion of the data in the context of extant literature. There should be a concluding paragraph highlighting the main conclusions, as well as referring to future direction of research.

References: List the references you cite in the text in alphabetical order (by the first authors' names).

Figure Legends: This section must provide a brief description of the figures in the order they are referred to in the text.

Figures: The figures should appear at the end of the paper, in sequential order.

4. Lab Performance (15%)

Attendance will be taken for each lecture/lab, as important information pertaining to the lab work is imparted in each of these classes. Furthermore, you will need to demonstrate responsibility and punctuality in running the behavioural procedures, as you will be part of a tight daily roster (see below). Your performance in all aspects of lab work will be assessed in consultation with Kim Kovaszi, and the teaching team.

For all lab work (and presentations), you will be working closely in groups of 4. We will ask you to get into a group (A-F) in the first week of lecture. Each group will be assigned 4 animals (whose treatment identity will be blind to you) that you will be responsible for throughout the duration of the course. The rats will undertake 5 different behavioural assays, some of which can be completed in a day (Elevated plus maze), while others will require repeated testing across a number of days (Water maze, operant task). All behavioural training must take place between 9am and 5pm. For behavioural tasks that require repeated training on consecutive days, it is essential that the rats are tested at roughly the same time everyday (i.e., morning or afternoon), so it is important that you work out a schedule that will ensure that at least two of you are available for the allocated time slot. Having said this, **the lab work must be equally distributed amongst the 4 of you**. There will be a signing in and out procedure (sign your name in and out (with times) on the whiteboard in SW148 for each training session), so the TAs can monitor each one of your contribution to behavioural testing. Turning up late for your slot will have implications for the rest of the testing schedule, so you must be punctual, at all costs. Also bear in mind that it will take time to weigh and transfer the animals to the testing room from the vivarium, so you must be prepared to come in a little earlier than the allotted time. Just to illustrate the enormity of your undertaking, here is what a week may look like for testing a total of 24 rats on an operant task, or water maze (see Table below). Weekend testing may be necessary.

Time for testing	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
9.00-10.00	Group A	Group A	Group A	Group A	Group A	Testing may	
10.00-11.00	Group B	Group B	Group B	Group B	Group B	sometimes be	
11.00-12.00			x	Group C	Group C	needed to be done	
12.00-1.00	Group C	Group C	x	Group D	Group D		
1.00-2.00	Group D	Group D	Group C	Group E	Group E		
2.00-3.00	Group E	Group E	Group D	Group F	Group F		
3.00-4.00	Group F	Group F	Group E				
4.00-5.00			Group F				

<u>Course Policies</u>

Missed quizzes

You are expected to make every effort to take the required quizzes. Absence from a quiz will only be granted for genuine, legitimate reasons, including a documented family emergency, or a documented severe illness. However, the completion of the first quiz is a mandatory requirement of the University for students working with animals. *Missing this lecture/quiz will mean that you will not be able to continue in the course.*

Grading

Scale

NUMERICAL MARKS	LETTER GRADE	GRADE POINT VALUE
90 - 100%	A+	4.0
85 - 89%	A	4.0
80 - 84%	A-	3.7
77 - 79%	B+	3.3
73 - 76%	B	3.0
70 - 72%	B-	2.7
67 - 69%	C+	2.3
63 - 66%	C	2.0
60 - 62%	C-	1.7
57 - 59%	D+	1.3
53 - 56%	D	1.0
50 - 52%	D-	0.7
0 - 49%	F	0.0

Guidelines (http://www.writing.utoronto.ca/advice/general/grading-policy):
A+ Outstanding performance, exceeding even the A described below.
A Exceptional performance: strong evidence of original thinking; good organization, capacity to analyse and synthesize; superior grasp of subject matter with sound critical evaluations; evidence of extensive knowledge base.
B Good performance: evidence of grasp of subject matter; some evidence of critical capacity and analytic ability; reasonable understanding of relevant issues; evidence of familiarity with the literature.
C Intellectually adequate performance: student who is profiting from her or his university experience; understanding of the subject matter and ability to develop solutions to simple problems in the material.
D Minimally acceptable performance: some evidence of familiarity with subject matter and some evidence that critical and analytic skills have been developed.
F Inadequate performance: little evidence of even superficial understanding of the subject matter; weakness in critical and analytic skills; with limited or irrelevant use of literature.

Note: for all written work, consistently poor spelling/grammar will be penalised. Please make use of the UTSC writing centre if you feel you need additional help with writing or want to develop your writing skills further: http://ctl.utsc.utoronto.ca/twc/.

Contesting a grade
All requests for a re-grade must be submitted **in writing** within two weeks of the day the grade is received. Only requests that include adequate written justification of an error in the original grading will be considered. *A legitimate request will result in the entire exam or assignment being re-graded. Your overall grade may be raised, lowered, or it may stay the same.* If there has been an error in our arithmetic, please let us know and we will immediately recalculate your grade (no written request necessary). **Arbitrary requests for grade increases will not be entertained (e.g., "I need to get into grad school, so could you please give me a higher grade?").**

Video and Auditory Recording
For reasons of privacy as well as protection of copyright, unauthorized video or audio recording in classrooms is prohibited. This is outlined in the Provost's guidelines on *Appropriate Use of Information and Communication Technology*. Note, however, that these guidelines include the

provision that students may obtain consent to record lectures and, "in the case of private use by students with disabilities, the instructor's consent must not be unreasonably withheld."

Copyright of lecture material
As protection of copyright, unauthorized copying, use, or uploading on www of any of the lecture slides, lecture handouts produced by Professor Ito is strictly prohibited.

Accessibility
Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the Access*Ability* Services Office as soon as possible. I will work with you and Access*Ability* Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC Access*Ability* Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca.

Academic Integrity
Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (http://www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

On tests and exams:
• Using or possessing unauthorized aids.
• Looking at someone else's answers during an exam or test.
• Misrepresenting your identity.
In academic work:
• Falsifying institutional documents or grades.
• Falsifying or altering any documentation required by the University, including (but not limited to) doctor's notes.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see http://www.utoronto.ca/academicintegrity/).