



PSY 460H1 S – Seminar in Learning

Tuesday 3-5 pm, Sidney Smith Hall Room 581

Contact Information

Instructor: Kaori Takehara-Nishiuchi, Ph. D.	Teaching Assistant(s): N/A
Virtual Office Hours: Appointment only	Office Hours: N/A

Course Description, Goals, and Prerequisites

Recent advances in research tools open the door to investigating the biological basis of various cognitive processes, such as memory, spatial navigation, decision making, and social interaction. In this course, we will read and discuss primary research articles on biopsychological experiments using non-human animals to gain insights into how cognitive processes are implemented in the brain. This course provides valuable opportunities 1) to learn cutting-edge tools in animal research and their applications to study biological bases of cognition and 2) to improve oral and written communication skills to express your thoughts and ideas on important, contentious questions in comparative and physiological psychology.

Prerequisite: PSY202H1/ ECO220Y1/ SOC252H1/ STA221H1/ PSY202H5/ STA221H5/ PSYC08H3/ STAB27H3/ STAC32H3, and PSY260H1/ PSYB38H3

Note about prerequisites: It is your responsibility to ensure that you have met **all** prerequisites listed in the Psychology section of the A&S Calendar for this course. If you lack any prerequisites, you will be removed. No waivers will be granted.

Although PSY290 is not a prerequisite for this course, you would enjoy the content with some basic understanding of molecular biology and physiology. Please study a lecture slide (BasicBiology.pdf) in Quercus to ensure that you are prepared to comprehend the research articles covered in this course.

Course Delivery

Weekly meeting: Before each class starts, you must read the assigned readings listed in the following section. The assigned chapter in the textbook provides the basic understanding of a topic assigned to each week. Two papers (Paper 1 and 2) are

primary research articles reporting groundbreaking results on the topic. For each of the primary research articles, one of you (presenter) will give a short presentation of the content, followed by a class discussion moderated by another student (discussant). Your active participation plays an important part to make the class experience valuable and enjoyable.

Class discussion starts with specific questions on the findings of the assigned article and their implications in the context of other related research (>70% of the time). Subsequently, it moves onto general questions about their relation to real-life examples and implications to mental disorders (<30% of the time). *Please keep in mind that class discussion is training to think critically and objectively.* It is not the time to casually “chat” about your personal feelings and comments on the assigned topic.

Office hours: Office hours will be held by appointment only. Please contact me via Quercus email to book an appointment for a meeting via Zoom or MicrosoftTeams.

Reading Material/Textbook(s)

This class requires that you keep up with the following readings. All articles are downloadable from the UofT library.

**Textbook: Fundamentals of Comparative Cognition by Sara Shettleworth (2012)
Oxford University Press**

Week 1 (January 10th) Primer

Textbook: Chapter 1

Course outline and a short lecture on methodologies used in contemporary biopsychological research

Week 2 (January 17th) Episodic memory

Textbook: Chapter 2, 17 – 34

Paper 1: Food-caching Western Scrub-Jays keep track of who was watching when.
Dally JM, Emery NJ, Clayton NS. *Science*. 2006; 312(5780), 1662-1665.

Paper 2: Replay of episodic memories in the rat. Panoz-Brown D, Iyer V, Carey LM, ...
Crystal JD. *Curr Biol*. 2018; 28(10):1628-1634.

Week 3 (January 24th) Associative learning

Textbook: Chapter 2, 34 - 41

Paper 1: A causal link between prediction errors, dopamine neurons and learning
Steinberg EE, Keiflin R, Boivin JR, Wittern IB, Deisseroth, K, Janak PH. Nature
Neuroscience. 2013; 16(7), 966-973.

Paper 2: Memory formation in the absence of experience. Vetere G, Tran LM, Moberg S
... Frankland PW. Nature Neuroscience 2019; 22, 933-940.

Week 4 (January 31st) Concept learning

Textbook: Chapter 2, 41 - 48

Paper 1: Same/different abstract-concept learning by pigeons. Katz JS, Wright AA. J
Exp Psychol: Anim Behav Proc. 2006; 32(1), 80–86.

Paper 2: Differences between neural activity in prefrontal cortex and striatum during
learning of novel abstract categories. Antzoulatos EG, Miller EK, Neuron. 2011; 71,
243–249.

Week 5 (February 7th) Spatial navigation

Textbook: Chapter 3, 49-57

Paper 1: Way-finding in displaced clock-shifted bees proves bees use a cognitive map.
Cheeseman JF, Miller CD, Greggers U, . . . Menzel R. Proc Natl Acad Sci U S A,
2014; 111(24), 8949-8954.

Paper 2: Development of the hippocampal cognitive map in preweanling rats. Wills
TJ, Cacucci F, Burgess N, O'Keefe J. Science. 2010; 328(5985):1573-6.

Week 6 (February 14th) Foraging and Planning

Textbook: Chapter 3, 57-61; 66-72

Paper 1: Western scrub-jays anticipate future needs independently of their current
motivational state. Correia SP, Dickinson A, Clayton NS. Curr Biol. 2007;
17(10):856-61.

Paper 2: Sensitivity to "sunk costs" in mice, rats, and humans. Sweis BM, Abram
SV, Schmidt BJ, ... Redish AD. Science. 2018; 361(6398):178-181.

Week 7 (February 21st) Reading week: No class

Week 8 (February 28th) Numerical cognition

Textbook: Chapter 3, 61-66

Paper 1: Basic math in monkeys and college students. Cantlon JF, Brannon EM. PLoS
Biol. 2007; 5(12):e328.

Paper 2: Representation of the quantity of visual items in the primate prefrontal cortex. Nieder A, Freedman DJ, Miller EK. *Science*. 2002; 297(5587):1708-11.

Week 9 (March 7th) Tool-use

Textbook: Chapter 3, 73-80

Paper 1: Discovery of species-wide tool use in the Hawaiian crow. Rutz C, Klump BC, Komarczyk L, ... Masuda BM. *Nature*. 2016; 537(7620):403-7.

Paper 2: When pliers become fingers in the monkey motor system. Umiltà MA, Escola L, Intskirveli I, ... Rizzolatti G. *Proc Natl Acad Sci U S A*. 2008; 105(6):2209-13.

Week 10 (March 14th) Theory of mind

Textbook: Chapter 4, 81-88

Paper 1: Great apes anticipate that other individuals will act according to false beliefs. Krupenye C, Kano F, Hirata S, Call J, Tomasello M. *Science*. 2016; 354(6308):110-114.

Paper 2: Macaques exhibit implicit gaze bias anticipating others' false-belief-driven actions via medial prefrontal cortex. Hayashi T, Akikawa R, Kawasaki K, ..., Hasegawa I. *Cell Reports*. 2020; 30(13):4433-4444.

Week 11 (March 21st) Prosocial behaviour

Textbook: Chapter 4, 89-92

Paper 1: Rat behavior and dopamine release are modulated by conspecific distress. Lichtenberg NT, Lee B, Kashtelyan V, ... Roesch MR. *Elife*. 2018;7. pii: e38090.

Paper 2: Prosocial choice in rats depends on food-seeking behavior displayed by recipients. Márquez C, Rennie SM, Costa DF, Moita MA. *Curr Biol*. 2015; 25(13):1736-45.

Week 12 (March 28th) Social learning

Textbook: Chapter 4, 93-101

Paper 1: Potent social learning and conformity shape a wild primate's foraging decisions. Van de Waal, E., Borgeaud, C., Whiten, A. *Science*. 2013; 340, 483-485.

Paper 2: Behavioral and neural correlates of hide-and-peek in rats. Reinhold AE, Sanguinetti-Scheck JI, Hartmann K, Brecht M. *Science*. 2019; 365(6458): 1180-

1183.

Week 13 (April 4th) Communication

Textbook: Chapter 4, 101-111

Paper 1: Allometry of alarm calls: black-capped chickadees encode information about predator size. Templeton CN, Greene E, Davis K. Science. 2005; 308(5730):1934-7.

Paper 2: Patterns of call communication between group-housed zebra finches change during the breeding cycle. Gill LF, Goymann W, Ter Maat A, Gahr M. Elife. 2015; 4.

Course Evaluation/Marking Scheme

III. Grading Criteria

Your final grade will be assessed as follows;

<i>Presentation</i>	<i>Date of your choice (20%)</i>
<i>Discussant</i>	<i>Date of your choice (10%)</i>
<i>Research proposal</i>	<i>March 14th (26%)</i>
<i>Discussion questions</i>	<i>Every class (44%)</i>

Course Webpage/Quercus

The website associated with this course is accessible via Quercus.

Course Policies

Contact: You can ask questions during the class. If you need to discuss any other issues and concerns, please contact me by sending an email via Quercus. I will try my best to reply to emails within three business days.

Absence from class: You will lose 4% points (assigned to Discussion questions) every class you miss. If you have legitimate excuses, such as family emergency, illness, and religious holidays, please record your absence through the ACORN online absence declaration. AND within one week of missing a class/assignment, please email me how many days you reported as an absence. Then, the missed mark for discussion questions will be re-weighted to those for the remaining weeks. The deadline for

research proposal will be adjusted based on the number of absent day. No make-up assignments/presentations will be accepted.

Penalties for Lateness: The research report is due **at 5 pm on March 14th (EST)**. The request for the deadline extension for the research report should be accompanied by legitimate excuses and must be submitted by three business days before the actual deadline. The penalty for late submission without a pre-approved extension is a reduction by 10% of the maximum mark applicable for each assignment for each business day that the assignment is late. Therefore, an assignment submitted more than ten business days after the deadline will have a mark of zero recorded for that assignment.

Copyright: The materials provided in this course are for the use of the students enrolled in the course. Any course materials should not be shared, distributed, or sold in print or digitally outside the course without permission.

Academic Resources

Accessibility Needs:

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 Accessibility Services at (416) 978 8060; accessibility.utoronto.ca.

Writing:

As a student here at the University of Toronto, you are expected to write well. The university provides its students with a number of resources to help them achieve this. For more information on campus writing centres and writing courses, please visit <http://www.writing.utoronto.ca/>.

Academic Integrity and Plagiarism:

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 (www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

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 www.utoronto.ca/academicintegrity/resourcesforstudents.html).

Other Resources

Student Life Programs and Services (<http://www.studentlife.utoronto.ca/>)

Academic Success Services (<http://www.asc.utoronto.ca/>)

Counselling and Psychological Services (<http://www.caps.utoronto.ca/main.htm>)

Details on Assignments

Presentation: You are required to present assigned articles at least once during the semester. Your presentation should clearly and concisely explain an introduction to the main hypothesis/question, methods, findings, and conclusions. The presentation should take no more than 20 minutes. Your presentation will be evaluated based on 1 (poor) to 5 (excellent) scales in the following five categories:

Content --- The presentation must include all the information needed for the audience to understand the main ideas of the article.

Organization --- The presentation should begin with an overview of what will be covered. Each idea or topic should be logically linked to the next topic. In some cases, it may be useful to review previous findings. The presentation should close with a summary of the main points.

Clarity --- The presenter needs to avoid using jargon found in the articles. Translate it to a simple word or phrase so that the audience can understand.

Oral delivery --- The presenter should speak clearly, loudly, and at an effective pace.

Discussant: At least once during the semester, you will play the role of a discussant who moderates the class discussion. It is the discussant's responsibility to ensure the discussion stays on topic and raise points/questions for discussion if necessary.

Research proposal: Research proposal is due **at 5 pm on March 14th (EST)**. Please submit your proposal to the "Assignment" page in Quercus.

In this assignment, you will propose an experiment (or a series of experiments) on one of the topics we cover during the course. You need to choose a topic different from the topic of your presentation. Your research proposal should include an introduction, main hypothesis/question, detailed method section, and a results section that shows the expected outcome. You might also consider what an unexpected outcome would mean for your hypothesis. The proposal will be evaluated based on the following criteria:

Importance of the main hypothesis --- The introduction summarizes sufficient background information to demonstrate why your main hypothesis is important.

Effectiveness of experiment(s) --- Sufficient justifications are provided to evaluate whether the proposed experiment is the best way to address the hypothesis.

Logic of expected outcome --- Expected results are logical and are thoroughly explained.

Novelty of research --- No previous publication uses the same methodologies and approaches for addressing the same hypothesis.

Your papers should be total minimum 12 pages and maximum 15 pages (double-spaced pages, not including references, tables, and figures, if any) with the list of

references in APA format. Please use 12-point font and 1-inch margins. Include a cover page with your name, student number, and the title of your proposal.

Discussion question: By 2 pm on every class time (starting from January 17th), you must submit a **one-page** paper of questions on the assigned readings in the “Assignments” page in Quercus. Each paper should include 1) three take-home messages of the assigned chapter of the textbook and 2) one question on Paper 1 and another question on Paper 2.

The questions can be points of confusion, issues for further consideration, and follow-up research ideas. Please type in a 12-point font. Put your name and the date at the top, not on a separate page. Each paper will be marked on a 4 point scale, where 1= off the mark; 2= acceptable, 3 = on the mark; 4 = insightful. Note you receive 0 points for an unacceptable or not-turned-in-on-time paper (because of missed class or lateness). You can earn up to 2 points (50% of the mark assigned to each paper) by actively sharing your thoughts and offering answers to questions raised by other students during the class discussion. As feedback, your mark will be posted in Quercus within one week.