PSYO 480/508
Advanced techniques in cognitive neuroscience
2024-2025 Winter Term 2
Mon Wed | 0800-0930 FIP138

I am looking forward to getting to know each of you while we explore cutting edge techniques in the field of cognitive neuroscience. My aim is to provide an engaging, respectful class environment where each student can practice critical thinking and apply their knowledge to further their understanding of the provided material.

This course will be conducted in part seminar-style (1st half), and lab classes/activities (2nd half), and requires in-person attendance due to the nature of the activities and key learning outcomes. Please see below for further detail.

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Email policy: ***All queries and discussion pertaining to course material, schedule, and evaluation criteria are to be directed to the Canvas discussion page, as many other students may have similar questions as you. These discussions are moderated by myself and the TA(s). Any emails containing above-noted queries will not be responded to. The last day to ask questions before deadlines (e.g., student-led article review and critical analysis, lab reports) is 2 business days prior to the deadline or we cannot guarantee a response.***

Only emails pertaining to topics of a personal nature and academic accommodations will be reviewed by Dr. Kraeutner. If you are emailing, you are required to put the course code in the subject line, or you will not receive a response due to volume of emails received.

Course Overview, Content, and Objectives

Through discussion, critical analysis, and lab activities, students in this course will develop an advanced understanding of key techniques (neuroimaging, and transcranial magnetic brain stimulation) used to discover new neuroscientific knowledge. This course is also designed to allow students to explore their own interests in the context of cognitive neuroscience. Active participation is required to complete this course.

With respect to research area, the emphasis will be placed on work conducted to characterize neuroplasticity underlying motor learning.

While participating in this course, we would like to acknowledge that we are gathered on the traditional, ancestral, and unceded territory of the Syilx Okanagan Nation.

COURSE DELIVERY/METHOD OF INSTRUCTION:

Course delivery will occur in person.

Class time will be divided between lectures, seminar-style presentations and discussion activities, and lab activities pertaining to past experiments conducted by researchers in the relevant fields.

Lectures, group discussions and student presentations. Since reading assignments will provide the foundation for all discussions and exercises, students will be required to complete reading assignments before class. Active participation of all students will be critical to the discussions throughout the course.

Lab activities. Lab activities will provide students with an enriched learning environment, and in-depth understanding of one key technique. Class time is devoted to completion of lab activities and lab reports. Lab activity 1 and 2 are designed to help students complete the lab report. Active participation of all students will be critical to completion of lab activities/reports. Demonstrations of research techniques in Dr. Kraeutner's lab may also be conducted (during class time) in small groups, pending availability of infrastructure and class size.

Please refer to the syllabus for the course schedule. Any changes related to course delivery will be announced and/or emailed. The syllabus will be updated to reflect any and all changes made to the course schedule.

Learning Outcomes

*Grounded in the Department of Psychology's 5 Program Learning Outcomes, this course is heavily focused on 1) developing **Scientific Inquiry and Critical Thinking Skills**, and 2) developing **Communication Skills** (encompassing presentations, peer-review, and teamwork). Below is a table that shows a breakdown of specific course learning outcome, how it is assessed, and which Program Learning Outcome it is aligned with.*

Course Learning Outcome	Assessment	*Program Learning Outcome*
Understand, evaluate, and appraise academic articles	Seminar/discussion lead	*Scientific Inquiry and Critical Thinking Skills, Communication, Ethical and Social Responsibility*
Describe and *understand* and key techniques in cognitive neuroscience	Group discussion/participation	*Knowledge Base, Scientific Inquiry and Critical Thinking Skills, Communication*
Appraise the application of key techniques in cognitive neuroscience address a broad range of research questions	Group discussion/participation	*Scientific Inquiry and Critical Thinking Skills, Communication*
Understand and *evaluate* results from experiments involving key techniques, *and appraise* interpretations	Written peer-review activity	*Scientific Inquiry and Critical Thinking Skills, Communication, Professional Development, Ethical and Social Responsibility*
Apply knowledge of key techniques to *analyze* data, *evaluate* lab results, and *create* interpretations	Written lab report assignments	*Scientific Inquiry and Critical Thinking Skills, Communication*

Note: Students will also gain basic technical skills in instrumentation, including describing and understanding steps to set up and use one key technique; these are not formally assessed

Evaluation Criteria and Grading:

Grading:

Discussion lead/presentation		25
Discussion participation*		20
Lab Activity 1 (mini skills)	*Pass/Fail*	5
Lab Activity 2 (structured report)	*Pass/Fail*	10
Peer Review Activity		15
Lab Activity 3 (lab report)		25
Total		**100**

*students will submit a written assessment and reflection of their participation and engagement during the course, and a grade. Marks will be split 50-50 between self and instructor assessment. If a student does not submit a written assessment/reflection, the maximum number of marks a student will receive is 10/20.

No additional or alternative opportunities for credit will be provided for fairness amongst all students. However, all students have an option for 2% bonus to be added to their grade – see 'Research Activity/SONA' section below.

Readings (please see schedule for important NOTES)

Functional MRI:
Bar & DeSouza 2016 *PLoS one : 10.1371/journal.pone.014*
Dayan & Cohen 2011 *Neuron : 10.1016/j.neuron.2011.10*
Kraeutner et al. 2022 *Neurorehabilitation and Neural Repair : 10.1177/15459683211006713*

MEG/EEG:
Burianova et al. 2013 *NeuroImage 10.1016/j.neuroimage.2013.01.001*
Kraeutner et al. 2013 *Brain Research 10.1016/j.brainres.2014.09.001*
Pfurtscheller and Neuper 1997 *Neuroscience Letters 10.1016/s0304-3940(97)00889-6*

TMS:
Hallett 2000 *Nature 10.1038/35018000*
Pascual-Leone et al. 1995 J *Neurophysiology 10.1152/jn.1995.74.3.1037*
Solomon et al. 2016 *Experimental Brain Research 10.1007/s00221-021-06232-3*

Lab-related papers
Davis et al. 2024 *Neuropsychologia* 10.1016/j.neuropsychologia.2024.109013
MacDonald et al. 2019 *Applied physiology, nutrition, and metabolism* 10.1139/apnm-2018-0643

Course Schedule

Date	Topic	Readings
1. Jan 8	Course overview lecture and logistics: what is neuroplasticity, and how can we measure it? **Students sign up to lead discussion (select dates)**	-
2. Jan 13	*Functional neuroimaging overview lecture*	These papers are designed to get you familiarized to and build upon today's material. Dr. Kraeutner recommends **picking one from each category** to review over the next week, that most captures your interests: **1) Functional MRI-based:** Bar & DeSouza 2016 *PLoS one* Dayan & Cohen 2011 *Neuron* Kraeutner et al. 2022 *Neurorehabilitation and Neural Repair* ***2) MEG/EEG-based:*** Burianova et al. 2013 *NeuroImage* Kraeutner et al. 2013 *Brain Research* *Pfurtscheller and Neuper 1997 Neuroscience Letters*
3. Jan 15	Neuroimaging seminar presentation 'how to' tutorial – A. Davis	- (overview of how to structure your presentation, the rubric, discussion structure)
4. Jan 20	Student discussion – slots 1 and 2	Students are required to 'sign up' for presentation days with their selected papers.
5. Jan 22	Student discussion – slots 3 and 4	
6. Jan 27	Student discussion – slots 5 and 6	
7. Jan 29	Student discussion – slots 7 and 8	

5. Feb 3	Student discussion – slots 9 and 10	If you are not presenting, you are encouraged to read the paper before each class. Active participation of all students is expected and will be critical to the discussions.
6. Feb 5	Student discussion – slots 11 and 12	
7. Feb 10	Student discussion – slots 13 and 14	
8. Feb 13	Student discussion – slots 15 and 16	
9. Feb 17	*Reading week (no class)*	-
10. Feb 19	*Reading week (no class)*	-
11. Feb 24	TBD	
12. Feb 26	*Brain stim overview lecture or guest lecture – What is TMS and what can we use it for*? Lab demo groups will be organized this class (for March 5/10, 24/26)	These papers are designed to get you familiarized to and build upon today's material. Dr. Kraeutner recommends **picking two** to review over the next week based on what interests you: Hallett 2000 *Nature* Pascual-Leone et al. 1995 J *Neurophysiology* Kraeutner et al. 2016 *Experimental Brain Research*
13. Mar 3	Getting to know EMG – what is a motor evoked potential? (Lab 1)	Initial demo and LAB #1 - EMG in class (mini skills, pass/fail)
14. Mar 5	*TMS demo A* – mapping structure to function (Lab 2)*	Lab #2 groups 1 and 2 *-this lab is loosely based on: Davis et al. 2024 Neuropsychologia* **this lab may be held in a different room*
15. Mar 10	*TMS demo B* – mapping structure to function (Lab 2)*	Lab #2 groups 3 and 4 *-this lab is loosely based on: Davis et al. 2024 Neuropsychologia* **this lab may be held in a different room*
16. Mar 12	*TMS lab tutorial*	Lab report due March 18 9AM (pass/fail) *Class time (tutorial days) is provided such that all students will be able to complete their lab reports within class time.* *Late lab reports will not be accepted as these are needed for the peer review activity.*
17. Mar 17	*TMS lab tutorial*	

18. Mar 19	*PEER REVIEW ACTIVITY DAY*	*All students are required to complete this assignment within class time.*
19. Mar 24	*TMS demo B* – measuring change in corticospinal excitability (Lab 3)*	Lab #3 groups 1 and 2 *-this lab is loosely based on: MacDonald et al. 2019 APNM* **this lab may be held in a different room*
20. Mar 26	*TMS demo B* – measuring change in corticospinal excitability (Lab 3) *	Lab #3 groups 3 and 4 *-this lab is loosely based on: MacDonald et al. 2019 APNM* **this lab may be held in a different room*
21. March 31	*TMS lab tutorial*	
22. April 2	*TMS lab tutorial*	
23. April 7	No class	Complete Discussion Participation Self-Evaluations; Lab report #3 due (graded) (Due week = April 7-12, with 1% deducted per day after April 7, with no submissions accepted after April 12 11:59PM).

RESEARCH ACTIVITY (2% BONUS)

This course allows for 2% bonus to be added to your final grade. This requirement may be fulfilled either through direct participation in research through the SONA volunteer subject pool (Option 1), by completing two written summaries of primary research articles (Option 2), or by a combination of the two typesof activities.

Research Participation (Option 1)

SONA RESEARCH ACTIVITY

Students earn Sona credit points for their eligible courses from participating in research activity. This can be either through direct participation in research through the Sona online research system (Option 1), by completing summaries of primary research articles (Option 2), or by a combination of the two types of activities. First year courses (i.e., PSYO 111 and PSYO 121) include 4% as part of the final course grade for participating in Sona research activity, while second year and higher courses allow for a 2% bonus to be added to the final course grade for participating.

Research Participation In Online Research System (Option 1)

As a participant in one of the numerous research studies posted at http://ubco.sona-systems.com/, you will obtain 0.5% credit for each 0.5 hour of participation. Hence, studies requiring a 1-hour time commitment provides a credit of 1%, 1.5 hours provides a credit of 1.5%, and 2 hours provides a credit of 2.0%, etc.

Important Requirements

You may participate in more than one study in order to earn credits. It is important to sign up for studies early in the semester in order to increase the odds that a timeslot is available. If you wait until later in the semester, timeslots may no longer be available.

Students must participate in at least one study from List A (that is either in-person, uses Zoom interactions, experience sampling, daily diary etc.) of any credit value for each in-person course they are seeking credit for. Studies will be identified as coming from List A or List B on Sona to assist students in ensuring they can fulfill this requirement. This requirement is limited to in-person courses only as there may be students who are taking courses fully remotely from a different location/time zone, for whom in-person or online synchronous studies would not be feasible, thus making it difficult to meet these requirements. Students registered in online courses can complete their credits from participation in studies from either entirely List A, entirely List B, or a combination of the two.

For 1st year:

This course will offer a maximum of 4 credits. You will only receive 4 credits if you complete at least 4 credits worth of studies with at least one study completed from List A and at least one study completed from List B. If you earn 4 credits only from a single list, you will receive a 0.5 credit penalty and only receive a maximum of 3.5 credits. This penalty is in effect regardless of how many credits have been earned; it deducts from the maximum amount that can be earned for the course.

For 2nd, 3rd, 4th year:

This course will offer a maximum of 2 credits. You will only receive 2 credits if you complete at least 2 credits worth of studies with at least one study completed from List A and at least one study completed from List B. If you earn 2 credits only from a single list, you will incur a 0.5 credit penalty and only receive a maximum of 1.5 credits. This penalty is in effect regardless of how many credits have been earned; it deducts from the maximum amount that can be earned for the course.

Logging On To The System

Sona is only open for those students who are registered in a psychology course offering Sona credit points. Please only use the request account option if you have never used the Sona system before. If you have used the Sona system before, please use the most recent login information you remember to log in.

Missed Appointments & Penalties

Missed appointments (i.e., failure to cancel the appointment at least 3 hours prior to the session) will be tracked. The consequence will be that you will not receive credit for participation in the study and you will be assigned an unexcused no-show. The unexcused no-show designation will cause you to lose the credit value of the study from the total possible credit points you can earn for your course. For example, if you are in PSYO 111 (or 121), you can earn up to 4.0 credits. If you miss an hour-long session that you signed up for (i.e., 1.0 credit) and don't cancel it in advance, the maximum credits that you can now earn for your course is 3.0, regardless of how many studies you complete.

If, after consenting to participate and starting a session (or survey), you decide to withdraw your consent, to avoid receiving an unexcused no-show on Sona, you must do one of the following:

- if it is an online study, you must cancel your Sona sign-up and/or contact Shirley (psyc.ubco.research@ubc.ca) if you are unable to cancel your sign-up;
- if it is an in-person study, you must let the researcher know directly. Their email can be found on the main description page for the study (little envelope icon). Depending upon the study, they will either cancel your session or assign you an excused no-show (meaning that you will not be penalized).

Your ability to withdraw your data will depend upon the study. Instructions for withdrawing your data (including limitations) will be described in the study's consent form.

Please email psyc.ubco.research@ubc.ca with any questions or concerns that you may have regarding the Sona system. Your professor or instructor does NOT have access to this information.

Research Summary Assignment (Option 2)

As an alternative to participating in research studies, you may obtain Sona credit points by completing library-writing projects to a satisfactory level. Each library-writing project is worth a total of two credits.

Important Requirements

1. This project consists of reading and summarizing (in written form) a recent, peer-reviewed, primary research article.
    - A "recent" article has been published within the past 12 months.

- A “peer reviewed” article is one that has been reviewed by other scholars before it is accepted – for example, it ***cannot*** be a news item, an article from a popular magazine, a notice, or a letter to the editor.
- A “primary” research article describes an experiment or study where data are collected by the authors. In other words, the article you choose to review ***cannot*** be a book review, literature review, or summary article.

2. You must choose an article published by one of the following agencies:
    - The American Psychological Society - *Psychological Science, Current Directions in Psychological Science, Psychological Science in the Public Interest,* or *Perspectives on Psychological Science*.
    - The American Psychological Association - www.apa.org/journals/by_title.html has a full listing.
    - The Canadian Psychological Association - *Canadian Psychology, Canadian Journal of Behavioural Science,* or *Canadian Journal of Experimental Psychology*.
    - The Psychonomic Society - *Behavior Research Methods, Cognitive, Affective, & Behavioral Neuroscience, Learning & Behavior, Memory & Cognition, Perception & Psychophysics,* or *Psychonomic Bulletin & Review*.
    - *Nature (or any nature sub-journal, such as Nature Human Behaviour, Scientific Reports)*
    - *NeuroImage*
    - *Human Brain Mapping*
    - *Journal of Experimental Psychology (and any of its sub-journals, such as Human Perception and Performance)*
    - *Journal of Cognitive Neuroscience*
    - *Journal of Neurophysiology*
    - *Neuroscience*
    - *Brain*
    - *Cortex*
    - *Brain Research*
    - *Behavioural Brain Research*
    - *Behavioural Neuroscience*
    - *Neurorehabilitation and Neural Repair*
    - ***Should you wish to choose an article in a journal not listed here, you are required to seek Dr. Kraeutner’s approval.***

3. Other Assignment Guidelines

The summary should be about 300-500 words in length. The source must be cited and referenced in accordance with the *Publication Manual of the American Psychological Association*. The review will be graded on a pass – fail basis (2% or 0%). At least **14 days before the end of classes** each term, submit the following to the course instructor:

- the article summary
- a copy of the article
- a cover page that specifies your name, student number, email address, and word count of the summary.
- the course title and number

Submitting the assignment 14 days in advance is necessary to ensure that you have an opportunity to make corrections, if required. If you do not check your email frequently, provide a phone number on the cover page.

UBC Okanagan Disability Resource Centre:

The Disability Resource Centre ensures educational equity for students with disabilities and chronic medicalconditions. If you are disabled, have an injury or illness and require academic accommodations to meet the course objectives, please contact Earllene Roberts, the Diversity Advisor for the Disability Resource Centre located in the University Centre building (UNC 214). UNC 214 250.807.9263

Email earllene.roberts@ubc.ca
Web: www.students.ok.ubc.ca/drc