PSYC 473 - NEUROBIOLOGY OF PSYCHIATRIC DISORDERS - Fall 2023

COURSE DESCRIPTION

Lectures focus on current theories on the neurobiology of psychiatric and neurodevelopmental disorders (e.g., schizophrenia, mood and anxiety disorders, autism). Student led seminars focus on the evaluation of animal models for investigating neural mechanisms of psychopathology.

INTENDED STUDENT LEARNING OUTCOMES

To complete this course, students will demonstrate their ability to**:**

1. Describe the value and limitations of using animal models to study human psychopathology.
2. Discuss hypotheses about the neurobiology of psychiatric disorders at multiple levels of analysis (e.g., genetic, epigenetic, molecular, cellular, neural structure and neural system levels)
3. Locate relevant, current literature, and summarize and integrate complex ideas from a broad literature
4. Write effectively for different purposes (e.g., short report geared for the lay public; short critical report geared for the scientific community)
5. Design and deliver an effective oral presentation (PowerPoint/Prezi/KeyNote)
6. Effectively participate in group discussions and peer evaluations

PREREQUISITES: **Prerequisite PSYC 370 or equivalent. Recommended PSYC 205 or PSYC 305.** There is **no** required text for the course.

ASSIGNMENTS AND GRADING

ASSIGNMENT	COMPONENTS	MARK
PRESS RELEASE	**Peer evaluation**	**5%**
	Instructor Evaluation	**20%**
ORAL PRESENTATION	**Peer evaluation**	**5%**
	Instructor Evaluation	**25%**
CLASS PARTICIPATION	• **Participation in seminars** • **Peer evaluations** • **Reader (X 2)**	**10%**
JOURNAL CLUB ARTICLE	**Due date - Dec 5 (midnight)**	**35%**

PRESS RELEASE

You will be assigned a paper published in the Proceedings of the National Academy of Science (PNAS). Your job is to craft a media-style press release, summarizing the paper for a non-expert audience. Your press release should capture the key findings and the primary take-home messages in a manner that an intelligent non-expert can comprehend.

Source Material:

- Your press release will be based on the same paper you are assigned for your oral presentation. Presentation dates and papers are listed under the "Student Presentations" sections of the course schedule.

Guidelines:

- **Length:** The press release should be no longer than two pages.
- **Language:** Use lay language tailored for a non-specialist audience.
- **Content:** Focus on the paper's key findings. While creativity is encouraged, grading will be primarily based on content.

Submission Details:

- **Due Date:** Submit your press release to me (as an email attachment) 3 DAYS BEFORE your scheduled oral presentation.
- **Format:** Send your press release to me as an email attachment as both .pdf and .doc files.
- **File Naming:** The press release should be named: yourlastname_PressRelease.filetype (e.g., Smith_PressRelease.doc and Smith_PressRelease.pdf).

Utilizing AI:

You must write the initial drafts of your Press Release on your own. Once your final draft is finished you have the option of using AI (e.g., ChatGPT) to polish it. If you take advantage of this option, you need to submit an additional file detailing your interaction(s) with the AI. This should list any questions, prompts, and information (i.e., your draft document) that you fed into the AI, as well as the AI's responses. For example, if you ask ChatGPT to "rephrase your draft in the style of a news article", your supplementary file will need to contain both that prompt, the text of your final draft and ChatGPT's output.

- **File Naming for AI Interaction:** yourlastname_PressRelease_AI.doc (e.g., Smith_PressReleaseAI.doc).
- **Authorship:** Acknowledge your used of AI on the facing page of the final version of your Press Release – at the author line, state your name along with the AI programs you used (e.g., Alex Smith, in collaboration with ChatGPT).
- **Tip:** Using AI should be an iterative process, e.g., check the AI 'rewrite' carefully to make sure that the AI has not changed the meaning of your content. You might also choose to edit some parts of the AI version, add in additional details, and/or limit the use of adjectives (ChatGPT is overly fond of adjectives – sometimes that works but sometimes using fewer adjectives is more impactful.

Postings:

The final version of your press release and the supplementary AI file (if applicable) will be posted at onQ prior to your presentation date.

Objective: The intention behind the press release is to set the stage for your oral presentation, providing a concise overview for your peers. Moreover, by sharing AI interactions transparently, we aim to familiarize the class with AI in a responsible and upfront manner.

ORAL PRESENTATION

You will each prepare a comprehensive, oral presentation show-casing your assigned paper. These are challenging papers. Don't worry if it takes you several reads (and searches in Google) before you understand them. Once you have 'decoded' your assigned paper, your job is to bring the class to the same level of understanding via a 25-30 min oral presentation. Gear your presentation for a mixed audience of senior undergrads with varying levels of background in behavioural neuroscience.

Guidelines:

- **Duration:** 25-30 min oral presentation, followed by a 10-15 min question/discussion period
- **Software:** Use a presentation software program of your choice, such as PowerPoint, Prezi, or KeyNote.
- **Content:** The paper might include several experiments – you don't need to (and probably shouldn't) cover them all. Choose the most relevant key findings to develop a well-rounded presentation that should include:
    - Relevant background information
    - Specific objectives of the study
    - Methods (describe behavioral methods in enough detail for the class to grasp what was done; molecular methods can be brief enough to capture end result (e.g., mice were engineered to express fewer 5-HT2 receptors)
    - Study results
    - Relevance of the article to our understanding of psychopathology
- **Assistance:**
  If you find any part of your paper challenging, don't hesitate to approach me. We can decipher it together.
- **Submission Details:**
    - **Due Date:** Submit your presentation slide-deck to me (as an email attachment) on the day of your presentation (preferably prior to class)
    - **File Naming:** The slide-deck file should be named: yourlastname_Presentation.filetype (e.g., Smith_Presentation.pptx).

CLASS PARTICIPATION

Evaluation of Student Press Releases and Oral Presentations:

- **Attendance at seminars is mandatory.**
- **Evaluations:** An evaluation form is available at onQ. The same form will be used to evaluate both press releases and oral presentations.
- **Format:** Please read and provide a concise, informal critique of each press release (PR), prior to the relevant class. Your evaluation of press releases should be around 150-200 words (free form), highlighting your key impressions. Consider aspects like layout, organization, clarity for lay audiences, strengths, weaknesses and whether the press release prepared you for the presentation. Complete your evaluation of the presentations during class (or shortly after). Give the kind of critical feedback that you yourself would find helpful – highlight what worked and what didn't, and what could be done to make it better.
- **Submission Details:**
    - **Due Date:** submit your evaluations to me (as an email attachment) within 24hrs of the relevant presentation.
    - **File Naming:** Email your evaluations with the following filename format: *YourLastName_PresenterLastName_Evaluation.docx (e.g., Smith_Brown_Evaluation.docx).* Remember to **put your last name first** in the file name to help me with tracking your submissions.

Role of the Reader:

- **Duty:** Each student will be a designated reader for two oral presentations.
- **Task:** Familiarize yourself with the paper being presented and prepare 4-5 questions to ask post-presentation. There's no need to send these questions in advance. Having them written down aids your participation in class.

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JOURNAL CLUB ARTICLE

For this assignment, you will write a concise scientific communication, but this time for an expert audience. You will select and review a contemporary empirical paper, presenting your insights and critiques.

Article Selection Criteria:
1. Topic Relevance: The article must relate to brain and psychopathology and can originate from clinical (human) or preclinical (animal) research.
2. Publication Date: It should have been published within the last 5-6 years (i.e., since 2017).
3. Journal Source: The article must come from one of these journals:

- Science
- Nature
- Nature Neuroscience
- The Journal of Neuroscience
- PNAS (any papers from PNAS are permitted, including the paper you presented)

Format Guidelines:
Refer to the Journal of Neuroscience Journal Club's style (link provided). However, ensure you adhere to the following specific class requirements:

1. **Word Limit:** 1500 words max, excluding references.
2. **Font:** Times New Roman, 11 point, single-spaced.
3. **Layout:** Both single and double column formats are acceptable. Choose as per your preference.
4. **Title:** Include a title and your name at the top, no separate title page needed.
5. **Headers:** Encouraged for better organization (optional).
6. **Referencing:** Use a numbered referencing system. While there's no cap on the number of references, ensure *at least 10* are not sourced from the original paper's reference list. The reference list does not contribute to the 1500 word limit.

Content Guide:
While your review must incorporate the paper's primary topic, research questions, and key findings, focus on going beyond just summarizing. Provide an original critique addressing points like:

- Limitations overlooked by the original authors.
- Alignment of findings with other published work.
- Any contradictory literature not highlighted by the authors.
- The paper's contributions to understanding the mental disorder discussed.
- Potential future research directions.

This is a mere guideline; you can adopt any approach for your critique. However, you must back your statements with appropriate citations. Remember, with this assignment, you are addressing experts; avoid over-explaining concepts they'd already know. When discussing experimental methods, be succinct yet illustrative.
Grading Criteria:

- **You will be assessed on:**
    - Content depth and relevance.
    - Readability and organization.
    - Grammar, spelling, punctuation.
    - Consistency in your chosen referencing style.

Tips:
Given the 1500-word limit, you might find condensing your insights challenging. Dedicate time for multiple drafts, aiming for clarity and brevity. Remember, your audience is well-versed with the topic, so avoid unnecessary elaborations.
Utilizing AI:
You must write a final draft of you Journal Club Article on your own. Once you have finished your final draft you have the option of using AI (e.g., ChatGPT) to polish it. As above, if you take advantage of this option, you need to submit an additional file detailing your interaction(s) with the AI, including any questions, prompts, and information (i.e., your draft document) that you fed into the AI, as well as the AI's response document.

- **File Naming for AI Interaction:** yourlastname_PressReleaseAI.doc (e.g., Smith_JournalClub_AI.doc).
- **Authorship:** Acknowledge your used of AI on the facing page of the final version of your Journal Club Article – at the author line, state your name along with the AI programs you used (e.g., Alex Smith, in collaboration with ChatGPT).
- **CHECK THE AI OUTPUT FOR ACCURACY!** This is a critical step because AI is prone to "making things up", especially references.

Submission Details:

- **Deadline:** Midnight, Dec 5. Note: A 1% deduction applies for every day past the deadline.
- **Filename for Submission:** *YourLastName_JournalClub.doc and YourLastName_JournalClub_AI.doc (if applicable)*
- **Send your submission(s)** to me as an email attachment.

MARKING SCHEME

Psych 473 will utilize a "Numbers In, Letters Out" marking scheme: The final grade you receive for the course will be derived by converting your numerical course average to a letter grade, according to Queen's Official Grade Conversion Scale.

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

Statement on Academic Integrity

The following statement on academic integrity builds on a definition approved by Senate and is designed to make students aware of the importance of the concept and the potential consequences of departing from the core values of academic integrity. It is highly recommended that this statement be included on all course syllabi. Instructors may also consider including this statement with each assignment.

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1), on the Arts and Science website (see http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity), and from the instructor of this course.

Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

Turnitin statement

This course makes use of Turnitin, a third-party application that helps maintain standards of excellence in academic integrity. Normally, students will be required to submit their course assignments through onQ to Turnitin. In doing so, students' work will be included as source documents in the Turnitin reference database, where they will be used solely for the purpose of detecting plagiarism.

Turnitin is a suite of tools that provide instructors with information about the authenticity of submitted work and facilitates the process of grading. Turnitin compares submitted files against its extensive database of content, and produces a similarity report and a similarity score for each assignment. A similarity score is the percentage of a document that is similar to content held within the database. Turnitin does not determine if an instance of plagiarism has occurred. Instead, it gives instructors the information they need to determine the authenticity of work as a part of a larger process.

Please read Turnitin's Privacy Pledge, Privacy Policy, and Terms of Service, which governs users' relationship with Turnitin. Also, please note that Turnitin uses cookies and other tracking technologies; however, in its service contract with Queen's Turnitin has agreed that neither Turnitin nor its third-party partners will use data collected through cookies or other tracking technologies for marketing or advertising purposes. For further information about how you can exercise control over cookies, see Turnitin's Privacy Policy:

Turnitin may provide other services that are not connected to the purpose for which Queen's University has engaged Turnitin. Your independent use of Turnitin's other services is subject solely to Turnitin's Terms of Service and Privacy Policy, and Queen's University has no liability for any independent interaction you choose to have with Turnitin.

SECTION TOPIC – BACKGROUND LECTURES		
WEEK 1	Wednesday, Sept. 6	Course objectives and structure
	Friday, Sept. 8	LECTURE 1 – Animal models of psychopathology
WEEK 2	Monday, Sept. 11	LECTURE 2 – Animal models of psychopathology
	Wednesday, Sept. 13	LECTURE 3 – Signaling molecules, gene expression and epigenetics
	Friday, Sept. 15	LECTURE 4 – Signaling molecules, gene expression and epigenetics
WEEK 3	Monday, Sept. 18	LECTURE 5 – Neuroscience methods
	Wednesday, Sept. 20	LECTURE 6 – Neuroscience methods

SECTION TOPIC - STRESS, ANXIETY AND DEPRESSION			
WEEK 3	**Friday, Sept. 22**	**LECTURE: Stress and psychopathology**	
WEEK 4	**STUDENT PRESENTATIONS**		**READERS**
	Monday, Sept. 25	**Presenter -** Rohn et al., (2023) Genetic modulation of the HTR2A gene reduces anxiety-related behavior in mice. *PNAS Nexus*, *2* (6)170.	
	Wednesday, Sept. 27	**Presenter -** Hesselgrave et al., (2021) Harnessing psilocybin: antidepressant-like behavioral and synaptic action of psilocybin are independent of 5-HT2R activation in mice. PNAS, 118 (16) e2022489118.	
	Friday, Sept. 29	**Presenter -** Dudek et al., (2020) Molecular adaptations of the blood–brain barrier promote stress resilience vs. depression. *PNAS, 117*, 3326–3336.	
WEEK 5	**Monday, Oct. 2**	**Presenter –** Raineki et al., During infant maltreatment, stress targets hippocampus, but stress with mother present targets amygdala and social behaviour. *PNAS 116 (45)* 22821-22832.	
	Wednesday, Oct. 4	**Presenter -** Ma et al., (2021) Amygdala-hippocampal innervation modulates stress-induced depressive-like behaviors through AMPA receptors. *PNAS 118* (6) e2019409118.	
	Friday, Oct. 6	**Presenter -** Concetti et al., (2020). Control of fear extinction by hypothalamic melanin-concentrating hormone–expressing neurons. *PNAS*, *117* (36) 22514-22521.	
WEEK 6	**Oct. 10–13**	**FALL TERM BREAK**	

SECTION TOPIC - NEUROBIOLOGY OF SCHIZOPHRENIA			
WEEK 7	**Monday, Oct. 16**	**LECTURE: Neurobiology of schizophrenia**	
	STUDENT PRESENTATIONS		**READERS**
	Wednesday, Oct. 18	**Presenter -** Wang, et al., (2018) Controlling of glutamate release by neuregulin3 via inhibiting the assembly of the SNARE complex. *PNAS,* 115 (10) 2508-2513.	
	Friday, Oct. 20	**Presenter -** Ma et al., (2023) Histamine H2 receptor deficit in glutamatergic neurons contributes to the pathogenesis of schizophrenia. *PNAS, 120* (9), 1-e2207003120.	
WEEK 8	**Monday, Oct. 23**	**Presenter -** Ma, et al., (2019) Key role of soluble epoxide hydrolase in the neurodevelopmental disorders of offspring after maternal immune activation. *PNAS,* 116 (14) 7083-7088.	
	Wednesday, Oct. 25	**Presenter -** Kim et al., (2022) SELENBP1 overexpression in the prefrontal cortex underlies negative symptoms of schizophrenia. *PNAS, 119* (51) e2203711119.	
	Friday, Oct. 27	**Presenter -** Tomasella et. al., (2018) Deletion of dopamine D_2 receptors from parvalbumin interneurons in mouse causes schizophrenia-like phenotypes. *PNAS,* 115 (13) 3476-348.	
WEEK 9	**Monday, Oct. 30**	**Presenter -** Wang, et al., (2018) Genetic recovery of ErbB4 in adulthood partially restores brain functions in null mice. *PNAS,* 115 (51) 13105-13110.	

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SECTION TOPIC – NEURODEVELOPMENTAL DISORDERS			
WEEK 9	**Wednesday, Nov. 1**	**LECTURE: Neurobiology of childhood psychiatric disorders**	
	STUDENT PRESENTATIONS		**READERS**
	Friday, Nov. 3	**Presenter -** Yardeni et al., (2021) An mtDNA mutant mouse demonstrates that mitochondrial deficiency can result in autism endophenotypes *PNAS, 118* (6) e2021429118.	
WEEK 10	**Monday, Nov. 6**	**Presenter -** Colombo et al., (2021) The K63 deubiquitinase CYLD modulates autism-like behaviors and hippocampal plasticity by regulating autophagy and mTOR signaling. *PNAS, 118* (47), 1.	
	Wednesday, Nov. 8	**Presenter -** Wiebe, et al., (2019) Inhibitory interneurons mediate autism-associated behaviors via 4E-BP2. *PNAS*, 116 (36) 18060-18067.	
	Friday, Nov. 10	**Presenter -** Wang, et al., (2019) Maternal diabetes induces autism-like behavior by hyperglycemia-mediated persistent oxidative stress and suppression of superoxide dismutase 2. *PNAS,* 116 (47) 23743-23752.	
WEEK 11	**Monday, Nov. 13**	**Presenter -** Zhou et al., (2022) Disruption of MeCP2-TCF20 complex underlies distinct neurodevelopmental disorders. *PNAS, 119 (4),* 1.	
	Wednesday, Nov. 15	**Presenter -** Robson, et al., (2018) p38α MAPK signaling drives pharmacologically reversible brain and gastrointestinal phenotypes in the SERT Ala56 mouse. *PNAS*, 115 (43) E10245-E10254.	

SECTION TOPIC - NEUROBIOLOGY OF SUBSTANCE USE DISORDER			
WEEK 11	**Friday, Nov. 17**	**LECTURE: Neurobiology of substance abuse.**	
WEEK 12	**STUDENT PRESENTATIONS**		**READERS**
	Monday, Nov. 20	**Presenter -** Venniro et al., (2020) Abstinence-dependent dissociable central amygdala microcircuits control drug craving. PNAS, 117 (14), 8126-8134	
	Wednesday, Nov. 22	**Presenter -** Duan et al., (2022) Compulsive drug-taking is associated with habenula–frontal cortex connectivity. *PNAS, 119* (50), e2208867119	
	Friday, Nov. 24	**Presenter -** Degoulet et al., (2021) Subthalamic low-frequency oscillations predict vulnerability to cocaine addiction. *PNAS, 118* (14) e2024121118.	
WEEK 13	**Monday, Nov. 27**	**Presenter -** Kallupia et al., (2020) Nociceptin attenuates the escalation of oxycodone self-administration by normalizing CeA–GABA transmission in highly addicted rats. *PNAS, 117* (4) 2140–2148.	
	Wednesday, Nov. 29	**Presenter -** Werner et al., (2020) Neuroadaptations in the dorsal hippocampus underlie cocaine seeking during prolonged abstinence. *PNAS, 117* (42) 26460–26469.	
	Friday, Dec. 1	**Presenter -** Kim, et al., (2018) Dopamine D2 receptor-mediated circuit from the central amygdala to the bed nucleus of the stria terminalis regulates impulsive behavior. *PNAS,* 115 (45) E10730-E10739.	
	Monday, Dec. 5	**Presenter –** TBA	