PSYC 473 - NEUROBIOLOGY OF PSYCHIATRIC DISORDERS - Fall 2021

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Office Hours: Mondays, 10:00 – 11:00 (or by appointment)

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: PSYC 205 and 271 or equivalent. 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 3 (midnight)**	**35%**

PRESS RELEASE

This assignment is based on a recently published article (presentation dates and articles are listed under the "Student Presentations" sections of the course schedule, below). be based on the same paper assigned for your oral presentation. Your job is to summarize the paper in a media style press release, written in lay language, for a non-expert audience (maximum length is 2 pages). The press release is due one week prior to your oral presentation and should be sent to me as an e-mail attachment. You can be as creative as you want but your mark will be primarily based on the content. You should aim to cover only the key findings (the big take-home message) in a way that an intelligent non-expert would understand. Press releases will be put on the PSYC 473 Web site to prepare your fellow students for the oral presentations. Take advantage of your press release to set the stage for your oral presentation, described below.

ORAL PRESENTATION

This assignment based on the same paper assigned for your press release. 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. You can use a presentation software program of your choice (e.g., PowerPoint, Prezi, KeyNote). Most of the assigned papers contain multiple experiments. You don't have to present them all - select what you think are the most representative findings and present those. You should include a summary of the relevant background information, specific purpose of the study, methods - with a primary focus on behavioral methods, and results of the article. You should also discuss the relevance of the article to our understanding of psychopathology.   If you get stuck on any part of your paper, please come and see me and we will work through it together. If you are not available during my office hrs, we can find another time to meet, either in-person or on TEAMs.

CLASS PARTICIPATION

1. **EVALUATION OF STUDENT PRESS RELEASES.** All students are expected to read and provide a broad, informal critique of **each** press release (PR). Your evaluation should take the form of a short paragraph (roughly150 words – this assignment is meant to be done quickly). Here are some examples of what you might address: Was the layout/formatting of the PR effective? Was the flow of the information well organized? Sentence structure? Grammar? Was the report clear and sufficient for a lay audience to understand? Was it attention grabbing? Was there any aspect that you really liked? That you think didn't work? What would make it better? Provide examples to support your comments. These questions are just a guide – you don't have to answer all (or any) of them. The goal is for you to provide *your* general impression of the PR. Give the kind of critical feedback that you yourself would find helpful (e.g., what worked and what didn't). Please do this prior to class. An electronic evaluation form will be posted online that you can use for entering your evaluation of the PR and oral presentation of a given presenter (see below).

2. **EVALUATION OF STUDENT ORAL PRESENTATIONS.** All students in the class are expected attend seminars and provide an informal, evaluation of **each** student oral presentation. These evaluations are done "on the fly" in class (i.e., during the presentation or shortly there after).
   Your evaluations forms should be emailed to me with the following file name: **Your last name-_presenter's last name_Psyc473.doc (e.g., Smith_Brown_Psyc473.doc).** The evaluations are due on the same day as the presentation. Please be sure to **put your last name first** (that's helps me keep track of your participation).

3. **READER**. Each student will serve as an assigned reader for two oral presentations. The reader's role is to read the empirical paper being presented and come to class with 4-5 questions (written out) that you will ask at the end of the presentation. (You do <u>NOT</u> have to send your questions to me, having them written out just makes it easier for you in class).

JOURNAL CLUB ARTICLE

The *Journal Club article* is your opportunity to write a brief, scientific communication for experts rather than a lay audience. For this assignment you will select and review a topical empirical paper of your choice. It can be the paper you did your oral presentation on, any other empirical paper showcased in class or a paper that wasn't covered in class. The only restrictions are that the paper you review:
1) has to be relevant to some aspect of the brain and psychopathology (it can come from either the clinical (human) or preclinical (animal) literature or both)
2) has been published in the last 5-6 years (i.e., since 2015)
3) is selected from one of the following journals: *Science; Nature; Nature Neuroscience; The Journal of Neuroscience; or PNAS.*

Your review should be styled like a Journal Club submission to *The Journal of Neuroscience* Journal Club (https://www-jneurosci-org.proxy.queensu.ca/content/jneurosci-journal-club.)
Note, there are some minor changes to the formatting requirements listed at that website and the ones for your class assignment. Please follow the formatting requirements listed below:

Formatting for the Journal Club Article
1) **1500 words max** (not including references); Times New Roman font, 11pnt, single spaced.
2) Either single or double columns are acceptable - go with your preference
3) Title is required but not on a separate title page; just put the title and your name at the top of the page
4) Headers in the text are encouraged as an organizational tool (but are not required)
5) Use a numbered referencing system
6) There is no limit to the number of references you use, but **at least 10 references** must not come from the reference list of the original paper you are critiquing.

As stated at *The Journal of Neuroscience* website, you should include a brief description of the topic and research question(s) addressed in the paper you are reviewing, a summary of the key findings and brief discussion of why they are important. **Your review must do more than just summarize the original article**. You need to provide a rational, original critique of the work, e.g., Are there any limitations that the original authors failed to adequately address? How well do the findings fit with other reports on the same topic? Are they supported by other reports in the literature? Did the authors fail to report any contradictory literature? How do the findings advance our understanding of the specific mental disorder under investigation? Where should the research go next? These are just general guidelines to get you started (and will not apply to all papers). You might approach your critique in a completely different way, but whatever direction you take it in, you must support your comments by citing the relevant literature.

You will be graded for content, overall readability, organization, grammar, spelling, punctuation, and a correct referencing style - I am fine with any referencing style, pick one and use it consistently. 1500 words, single spaced is roughly 2 pages. It can be very challenging to get everything you want to say into a short report. You will want to give yourself enough time to edit several drafts of your work and aim for tight precise prose. You are writing for an expert audience and so do not have to define concepts or over-describe things that an expert should be aware of. The experimental approach should be illustrated, but briefly, e.g., if the authors tested rats in an elevated plus-maze then all you need to say is something like; "the rats were tested in the elevated-plus maze, widely used to study anxiety-related responses in rodents" – reference your source and then indicate the findings.

If you do choose a recent paper (published within the last 2 months) from J. Neurosci, you could consider submitting your review article to that journal for publication). Examples of Journal Club articles and the relevant original paper under review are available at *The Journal of Neuroscience* and at our OnQ Course website

Your Journal Club Article is due by midnight, **Dec 3** (1% deduction for every day a paper is late). Please email your article to me using the following file name: YourLastName_JournalClub_Psyc473.doc

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.

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SECTION TOPIC – BACKGROUND LECTURES		
WEEK 1	**Tuesday, Sept. 7**	Course objectives and structure
	Thursday, Sept. 9	LECTURE 1: Animal models of psychopathology
WEEK 2	**Monday, Sept. 13**	LECTURE 2: Animal models of psychopathology
	Tuesday, Sept. 14	LECTURE: 3 Signaling molecules, gene expression and epigenetics
	Thursday, Sept. 16	LECTURE: 4 Signaling molecules, gene expression and epigenetics
WEEK 3	**Monday, Sept. 20**	LECTURE: 5 Neuroscience methods
	Tuesday, Sept. 21	LECTURE: 6 Neuroscience methods

		SECTION TOPIC - STRESS, ANXIETY AND DEPRESSION	
WEEK 3	**Thursday, Sept. 23**	LECTURE 7: Stress and psychopathology	
WEEK 4		**STUDENT PRESENTATIONS**	**READERS**
	Monday, Sept. 27	Dudek et al., (2020) Molecular adaptations of the blood–brain barrier promote stress resilience vs. depression. *PNAS, 117,* 3326–3336	
	Tuesday, Sept. 28	Nakayama et al., (2020) Seasonal changes in NRF2 antioxidant pathway regulates winter depression-like behavior. *PNAS, 117* (17) 9594–9603.	
	Thursday, Sept. 30	Porcu et al., (2020) Vulnerability to helpless behavior is regulated by the circadian clock component CRYPTOCHROME in the mouse nucleus accumbens *PNAS, 117* (24) 13771–13782.	
WEEK 5	**Monday, Oct. 4**	Shen et al., (2020) Synaptotagmin-7 is a key factor for bipolar-like behavioral abnormalities in mice. *PNAS, 117,* 4392–4399.	
	Tuesday, Oct. 5	Duque-Wilckens et al., (2020) Extrahypothalamic oxytocin neurons drive stress-induced social vigilance and avoidance. *PNAS, 117* (4) 26406–26413.	
	Thursday, Oct. 7	Zhang et al., (2020) Targeting presynaptic H3 heteroreceptor in nucleus accumbens to improve anxiety and obsessive-compulsive-like behaviors. *PNAS, 117* (50) 32155–32164.	
WEEK 6	Oct. 11–15	**FALL TERM BREAK**	

		SECTION TOPIC - NEUROBIOLOGY OF SCHIZOPHRENIA	
WEEK 7	**Monday, Oct. 18**	LECTURE: Neurobiology of schizophrenia	
	STUDENT PRESENTATIONS		**READERS**
	Tuesday, Oct. 19	Wang, et al., (2018) Controlling of glutamate release by neuregulin3 via inhibiting the assembly of the SNARE complex. *PNAS,* 115 (10) 2508-2513.	
	Thursday, Oct. 21	Jiao, et al., (2017) Transmembrane protein 108 is required for glutamatergic transmission in dentate gyrus. *PNAS 2017*, 114, 1177-1182.	
WEEK 8	**Monday, Oct. 25**	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.	
	Tuesday, Oct. 26	Diamantopoulou, et al., (2017) Loss-of-function mutation in *Mirta22/Emc10* rescues specific schizophrenia-related phenotypes in a mouse model of the 22q11.2 deletion. *PNAS, 114* (30), E6127-E6136	
	Thursday, Oct. 28	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, Nov. 1**	Wang, et al., (2018) Genetic recovery of ErbB4 in adulthood partially restores brain functions in null mice. *PNAS,* 115 (51) 13105-13110.	

		SECTION TOPIC - NEUROBIOLOGY OF CHILDHOOD PSYCHIATRIC DISORDERS	
WEEK 9	**Tuesday, Nov. 2**	LECTURE: Neurobiology of childhood psychiatric disorders	
		STUDENT PRESENTATIONS	**READERS**
	Thursday, Nov. 4	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. 8**	Bhattacherjee, et al., (2017) Neuronal cytoskeletal gene dysregulation and mechanical hypersensitivity in a rat model of Rett syndrome. *PNAS, 114,* E6952-E6961.	
	Tuesday, Nov. 9	Wiebe, et al., (2019) Inhibitory interneurons mediate autism-associated behaviors via 4E-BP2. *PNAS*, 116 (36) 18060-18067.	
	Thursday, Nov. 11	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. 15**	Yan, et al., (2018) Activation of autophagy rescues synaptic and cognitive deficits in fragile X mice. *PNAS,* 115 (41) E9707-E9716.	
	Tuesday, Nov. 16	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 ABUSE	
WEEK 11	**Thursday, Nov. 18**	LECTURE: Neurobiology of substance abuse.	
WEEK 12		**STUDENT PRESENTATIONS**	**READERS**
	Monday, Nov. 22	Ordoñes Sanchez et al., (2021) Early life adversity promotes resilience to opioid addiction-related phenotypes in male rats and sex-specific transcriptional changes. *PNAS, 118* (8) e2020173118.	
	Tuesday, Nov. 23	Uhl, et al., (2018) Cocaine reward is reduced by decreased expression of receptor-type protein tyrosine phosphatase D (PTPRD) and by a novel PTPRD antagonist. *PNAS,* 115 (45) 11597-11602.	
	Thursday, Nov. 25	Degoulet et al., (2021) Subthalamic low-frequency oscillations predict vulnerability to cocaine addiction. *PNAS, 118* (14) e2024121118.	
WEEK 13	**Monday, Nov. 29**	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.	
	Tuesday, Nov. 30	Werner et al., (2020) Neuroadaptations in the dorsal hippocampus underlie cocaine seeking during prolonged abstinence. *PNAS, 117* (42) 26460–26469.	
	Thursday, Dec. 2	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.	