PSYT-522: Early Adversity Development & Health

Term and year (start): Winter 2023

Course pre-requisite(s): BIOL 201, BIOC/ANAT 212, BIOL 202, ANAT 322, BIOL 306, BIOL 370 or equivalent.

Course schedule: Wednesdays 1-4PM (3hrs/week) location: McGill downtown campus

Number of credits: 3

Responsible Instructor: Claire-Dominique Walker, Professor

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Office hours: TBA

Communication plan: e-mail, meetings via Zoom, in person (48hrs response time)

Co-responsible instructors: Naguib Mechawar, Professor

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Patricia Silveira, Associate Professor

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Course overview

This course will familiarize students with the concept of adversity during critical developmental periods from gestation to adolescence and examine neurodevelopmental mechanisms, neural pathways and plasticity leading to vulnerability and resilience. We will also describe how single-cell expression patterns, neuronal networks and gene association studies can inform about the biological underpinnings of adversity, the individual differences in susceptibility and how these biological mechanisms link psychopathologies to other comorbidities. The topic of this course is new in the McGill teaching curriculum.

Learning outcomes:

Following participation in the PSYT-522 course, students should be able to:

• List the multiple facets of early adversity and be able to explain some of the known cellular and circuit mechanisms leading to long-term consequences on health and behaviour.

• Recognize the different sensitive developmental windows leading to psychopathologies and understand the specific characteristics of each.

• Explain how gene by environment (GxE) interactions determine health outcomes and how to construct a polygenic risk factor to address specific health vulnerabilities.

Course structure:

The course is divided into 7 short sections of 1-2 weeks each with research discussed around the unifying theme of early-life adversity. Each class will include a formal lecture by the lecturer and literature review and discussion by the class. Each subsection will be led by a different professor and will address specific topics.

There is no need for specific hardware or software in this course. The course will not be recorded.

Learning activities and part of the assessments (oral paper presentation/participation) will take place in person during class. Other components of the final grade (final exam) might be taking place remotely via myCourses or in person (will be determined at the beginning of class according to current University guidelines).

Expectations for student participation:

Class participation is worth 5% of the final grade. This part of the assessment includes class attendance and class participation. Class participation will be assessed with the help of a common rubric for all sections.

Students will be required to check myCourses for course updates and announcements at least bi-weekly during the semester.

Students who anticipate not being able to take part in certain portions of the course should contact the course coordinator as soon as possible so that specific readings that cover the material of the course can be provided to the student. Students will be encouraged to participate in all classes as participation is an important component of the learning in this course.

Required course materials:

A list of required readings will be provided at the beginning of the course for all sections of the course. Similarly, a list of essay questions will be provided at the beginning of the course in order for the students to choose their topic of interest for their essay.

Course content:

The course is divided into the following specific topics:

1. General overview of early-life adversity and effects on the corticolimbic circuit for emotion regulation and regulation of stress responses (Dr. Claire-Dominique Walker, weeks 1-2).

This portion of the course will briefly introduce the concept of early adversity, neurodevelopmental windows in human and animal models and more specifically will examine the impact of early-life adversity on emotional regulation and stress responsiveness. Studies addressing underlying biological mechanisms will be discussed in both humans and animal models.

2. Environmental disasters during pregnancy, long-term effects in the offspring, the mechanisms of these effects, and vulnerability and protective factors that moderate these effects. (Dr. Suzanne King, weeks 3-4)

Background literature on prenatal maternal stress and how it has been studied in humans using retrospective epidemiological methods, and prospective studies of maternal mood and life events. A description of studies using natural disasters will allow discussion of some of the main

effects of different types of maternal stress, and its timing in pregnancy on cognitive, behavioral, physical and motor development. This section will also examine mediators and moderators of the effects of disaster exposure in utero and outline remaining gaps in the literature, and knowledge mobilisation.

3. Psychiatric vulnerability in adolescence: Cellular and molecular underpinnings and impact of adverse experiences. (Dr. Cecilia Flores, weeks 5-6).

Translational findings will be discussed in the context of the ongoing prefrontal cortex development in adolescence and how it is impacted by exposure to drugs of abuse or social stress during this time. This will be followed by a discussion on biomarkers of psychiatric risk and resilience in adolescence.

4. Post-mortem brain research on the lasting consequences of childhood abuse. (Dr. Naguib Mechawar, weeks 7-8).

In this section, we will discuss human brain banking, psychological autopsies and post-mortem assessment of childhood abuse, the evolution of post-mortem research on early-life adversity, and recent studies indicating lasting changes in cerebral neuroplasticity in people with a history of childhood abuse.

5. Functional genomic changes in individuals with histories of child abuse: Studying the molecular cross talk of multiple mechanism of genomic regulation. (Dr. Corina Nagy, weeks 9-10)

This section of the course will examine how studying regional multimodal molecular information in bulk tissue and at the level of single-cell can inform about the mechanisms by which early-life experience profoundly influence genomic brain regulation.

6. Gene by Environment interactions in early life and their long-term effects (Dr. Patricia Silveira, weeks 11-12)

This section will introduce how to characterize the genetic component in Gene by Environment (GxE) studies going from candidate genes to genome-wide association studies and polygenic scores, and how these studies can inform about pathways leading to health vulnerability. Studies of GxE interactions will be discussed in order to determine how the genetic background modifies the response to adversity: definition, identification and interpretation.

7. Adversity in the early-life social environment: long-term outcomes, biopsychosocial mechanisms, and opportunities for interventions. (Dr. Massimiliano Orri, week 13)

In this section, we will discuss the association of chronic exposure to adverse psychosocial environments at the micro-level (e.g., family), meso-level (e.g., neighborhood), and macro-level (e.g., broad societal and economic characteristics) with long-term health outcomes. We will also discuss the mechanisms explaining these associations, as well as potential interventions to mitigate long-term negative outcomes and promote resilience.

Week	Date	Description	Course materials	Assignments due
1	Jan 4, 2023	General overview of ELA	Lecture Paper discussion	none
2	Jan 11	Emotional circuit	Lecture Oral presentation section 1	Oral presentation 1 (2x2 students)
3	Jan 18	Environmental disasters during pregnancy	Lecture Paper discussion	
4	Jan 25	Mechanisms of vulnerability and resilience	Lecture Oral presentation section 2	Oral presentation 2 (2x2 students)
5	Feb 1	Vulnerability in adolescence	Lecture Paper discussion	
6	Feb 8	Social stress, drug abuse and prefrontal cortex development	Lecture Oral presentation section 3	Oral presentation 3 (2x2 students)
7	Feb 15	Post-mortem brain research	Lecture Paper discussion	
8	Feb 22	Cerebral neuroplasticity after ELA	Lecture Oral presentation section 4	Oral presentation 4 (2x2 students)
9	March 8	Functional genomic regulation	Lecture Paper discussion	
10	March 15	Single-cell molecular information	Lecture Oral presentation section 5	Oral presentation 5 (2x2 students)
11	March 22	Gene-by-environment interactions	Lecture Paper discussion	
12	March 29	GWAS and polygenic scores	Lecture Oral presentation section 6	Oral presentation 6 (2x2 students) Deadline for essays
13	April 5	Biopsychosocial mechanisms and interventions	Lecture Paper discussion section 7	

Evaluation:

There will be several evaluation components to compose the final grade:

• One short essay on a specific topic related to the course theme and presentation (10 pages excluding references, double-spaced) worth 35% of the final grade. A list of essay questions will be provided at the beginning of class. Essays are due on one of 2 deadlines indicated (prior to study break and by the end of the course). Students can choose on which topic they will write their essay and their choice will be registered during the first week of class. A short video presenting the various topics will be placed in myCourses at the beginning of class to facilitate the choice (Tentative and subject to production). Essays will be submitted and graded through myCourses. Late submission of essays will be penalized with a reduced grade of 5%/day late. Students may be late without penalties if this result from exceptional circumstances that have been discussed with the responsible instructor and adequately documented. Students have to choose a topic within a course section that is different from the one they will be doing their paper presentation for.

• One paper presentation in class worth 30% of the final grade (is done as a group of 2-3 students and subjected to a group grade). A list of suggested papers and guidelines to choose other papers will be provided at the beginning of class and the student presentation will be approximately 30 min.

• One final exam (short answer questions) worth 30% of the final grade. The final exam will be administered in person during the final exam period.

• Class participation worth 5% of the final grade (this part of the assessment includes class attendance and class participation. Will be assessed with the help of a common rubric for all sections. Due date is end of term.

• Students can submit in English or French any written work subjected to grading. Oral paper presentations are preferred in English.

General statements concerning the course

Language of written work

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives." (Approved by Senate on 21 January 2009)

Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté, sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue. » (Énoncé approuvé par le Sénat le 21 janvier 2009)

Academic integrity

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures" (Approved by Senate on 29 January 2003) (See McGill's guide to academic honesty for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires » (Énoncé approuvé par le Sénat le 29 janvier 2003) (pour de plus amples renseignements, veuillez consulter le guide pour l'honnêteté académique de McGill.)

Additional statements

The University is committed to maintaining teaching and learning spaces that are respectful and inclusive for all. To this end, offensive, violent, or harmful language arising in contexts of the class discussions or any form of communication between peers and peers and lecturers will not be tolerated and might lead to seeking disciplinary action from the University.

As instructors of this course, we endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with the responsible instructor and/or the Office for Students with Disabilities.

Many students may face mental health challenges that can impact not only their academic success but also their ability to thrive in our campus community. Please reach out for support when you need it; many resources are available on-campus, off-campus, and online.

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.