Syllabus PSY992, Spring 2021, Neurobiology of Stress, Online Mon 3-5.50 pm

Instructor:
Alexa Veenema; ISTB 4018; Office hours: by appointment; aveenema@msu.edu

Course prerequisites
Students should have a basic knowledge of the nervous system.

Course Description
The course will give an overview of the neural systems involved in the stress response from the molecular and cellular to the behavioral level. We will discuss the roles of the hypothalamic-pituitary-adrenal axis in the stress response and the effects of stress on neuronal plasticity, learning and memory, and mental health and disease. Emphasis will be on the mechanisms mediating vulnerability and resilience to stress. The long-term consequences of early life stress on cognitive, emotional, and social behaviors will also be discussed. Students will present current research articles covering experimental findings in both animals and humans.

Course Readings
The course material consists of scientific journal articles (research reviews and primary research articles). To discuss the very latest discoveries in the stress field, students will present primary research articles from 2019-2021. The journal articles serve as a basis for the class lectures in which we will further elaborate on the specific topics. Please read the journal articles in advance and be prepared to discuss them in class.

Organization of Course

January 25	Topic 1	Basics of the stress response
February 1	Topic 2	Stress and the HPA axis
February 8	Topic 2	Stress and the HPA axis/
February 15	Topic 3	Stress and Neuronal Plasticity
February 22	Topic 3	Stress and Neuronal Plasticity
March 1	**EXAM 1**	**Topics 1-3**
March 8	Topic 4	Stress and Learning and Memory
March 15	Topic 4	Stress and Learning and Memory
March 22	Topic 5	Stress and Mental Health
March 29	Topic 5	Stress and Mental Health
April 5	Topic 6	Early Life Stress
April 12	Topic 6	Early Life Stress
April 19	**EXAM 2**	**Topics 4-6**

Topic 1: Basics of the stress response

Readings

1. Levine S. Stress: a historical perspective. *Chapter 1.1 in Handbook of Stress and the Brain*. Eds. T. Steckler, N. Kalin, J Reul, 2005.
2. Ulrich-Lai YM, Herman JP. Neural regulation of endocrine and automatic stress responses. *Nature Reviews Neuroscience*, 2009.
3. Joëls M, Baram TZ. The neuro-symphony of stress. *Nature Reviews Neuroscience*, 2009.

Topic 2: Stress and the HPA axis

Readings

1. De Kloet ER, Han F, Meijer OC. From the stalk to down under about brain glucocorticoid receptors, stress and development. *Neurochemical Research*, 2008.
2. Lightman SL, Conway-Campbell BL. The crucial role of pulsatile activity of the HPA axis for continuous dynamic equilibration. *Nature Reviews Neuroscience*, 2010.
3. Karssen AM, Meijer OC, De Kloet ER. Corticosteroids and the blood-brain barrier. *Chapter 3.4 in Handbook of Stress and the Brain*. Eds. T. Steckler, N. Kalin, J Reul, 2005.
4. Joëls M, Karst H, DeRijk R, de Kloet ER. The coming out of the brain mineralocorticoid receptor. *Trends in Neuroscience*, 2008.

Topic 3: Stress and Neuronal Plasticity

Readings

1. Sapolsky RM. Why stress is bad for your brain. *Science*, 1996.
2. Sapolsky RM. Stress and plasticity in the limbic system. *Neurochemical Research*, 2003.
3. McEwen BS. Plasticity of the hippocampus: adaptation to chronic stress and allostatic load. *Annals of the New York Academy of Sciences*, 2001.
4. Herman JP, Flak J, Jankord R. Chronic stress plasticity in the hypothalamic paraventricular nucleus. *Progress in Brain Research*, 2008.
5. Arnsten AF. Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience*, 2009.
6. Research article(s) to be presented by student(s)

Topic 4: Stress and Learning and Memory

Readings

1. Joëls M, Pu Z, Wiegert O, Oitzl MS, Krugers HJ. Learning under stress: how does it work? *Trends in Cognitive Sciences*, 2006.
2. Roozendaal B, McEwen BS, Chattarji S. Stress, memory, and the amygdala. *Nature Reviews Neuroscience*, 2009.
3. Sandi C. Stress, cognitive impairment and cell adhesion molecules. *Nature Reviews Neuroscience*, 2004.
4. Research article(s) to be presented by student(s)

Topic 5: Stress and Mental Health

Readings

1. De Kloet ER, Joëls M, Holsboer F. Stress and the brain: from adaptation to disease. *Nature Reviews Neuroscience*, 2005.

2. McEwen BS, Gianaros PJ. Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. *Annual Review of the NY Academic of Sciences*, 2010.
3. Feder A, Nestler EJ, Charney DS. Psychobiology and molecular genetics of resilience. *Nature Reviews Neuroscience*, 2009.
4. Research article(s) to be presented by student(s)

Topic 6: Early life stress
Readings
1. Heim C, Nemeroff CB. The Role of Childhood Trauma in the Neurobiology of Mood and Anxiety Disorders: Preclinical and Clinical Studies. *Biological Psychiatry*, 2001.
2. Veenema AH. Toward understanding how early-life social experiences alter oxytocin- and vasopressin-regulated social behaviors. *Hormones and Behavior*, 2012.
3. Schmidt MV. Animal models for depression and the mismatch hypothesis of disease. *Psychoneuroendocrinology*, 2010.
4. Research article(s) to be presented by student(s)

Online Course
This course will be 100% online and synchronous using Zoom. It is expected that all students attend all classes. Please reach out to the professor if this is not possible for you. Lectures and exams will take place during the scheduled class days. Lectures may be recorded and may be posted on D2L after the lecture. The recorded lectures are intended to supplement the classroom experience. These recordings may not be reproduced, shared with those not in the class, or uploaded to other online environments. Doing so may result in disciplinary action.

D2L
The syllabus, the required readings, and the lecture slides will be posted on D2L.

Assignments
There will be two online exams during class time. The exams consist of multiple choice and short essay-type questions. You will be tested on class lecture material and course readings. The exams will not be cumulative. Furthermore, each student will give a 30-45 min "undergraduate lecture" based on a recent research article within the field of neurobiology of stress. The student lecture should place the selected research article in a larger context and should stimulate a class discussion led by the student.

Overall grade
Each of the two exams will count for 1/3, the student lecture will also count for 1/3. It is expected that students will be actively participating in class, including responding to questions, asking questions, and participating in class discussions.

Grades
Grades will be assigned according the following scale: 90-100% = 4.0; 85-89% = 3.5; 80-84% = 3.0; 75-79% = 2.5; 70-74% = 2.0; 65-69% = 1.5; 60-64% = 1.0; < 60% = 0.

Make up exam
No make-up exams will be scheduled during the semester. If you missed an exam, you will need to discuss your options with the instructor. Please be aware that it is against MSU policy for a professor to give any individual student a special opportunity that is not provided to all students. We will not be allowed to provide individuals special chances for extra credit or extra opportunities to make up exams, etc.

Other issues
Please email the professor if you have any concerns about your ability to succeed in this course due to challenges of online learning and/or technology.

Please email the professor if you must miss class due to illness or self-isolation. We will try to work with you so that missed classes will not harm your performance or put you at a disadvantage in the class.

If you stay on MSU campus, please obey all MSU policies including those policies to slow the spread of COVID-19 (https://msu.edu/together-we-will/keeping-spartans-safe/).

Academic honesty: Article 2.3.3 of the Academic Freedom Report states that "The student shares with the faculty the responsibility for maintaining the integrity of scholarship, grades, and professional standards." The Department of Psychology adheres to the policies on academic honesty as specified in General Student Regulations 1.0, *Protection of Scholarship and Grades*; see https://ombud.msu.edu/resources-self-help). Cheating will be taken very seriously and any student that violates MSU rules (i.e. is caught cheating on any assignment) will be given a failing grade for the class, the incident will appear permanently on the students' record and the case will be brought to the attention of the Psychology Department advisors who may take further action.

Accommodations for students with disabilities: MSU is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a Verified Individual Services Accommodation ("VISA") form. Please present this form to Dr. Veenema at the start of the term and/or ***two weeks before the exam date***. Requests received after this date may not be honored.

Additional resources for students:
Spartan Code of Honor
RVSM Limits to Confidentiality
Mental Health
Tolerance and civility
Religious Observance Policy
Student Athletes
Pronouns