Course Time: Wednesday 2:00 pm to 4:50 pm
Course Location: Brown 115
Instructor: Nicolas Rohleder, PhD
Office hours: TBD and by appointment

### About the Course

Due to increasing life expectancies and the elimination or reduction of many causes of early mortality, interests in the Health Sciences is shifting from the battle against acute infectious diseases to the understanding of factors that determine morbidity and mortality in mid- and later life. Currently, psychosocial factors are estimated to account for approximately 30% of overall costs of illness in Western societies. The study of psychosocial factors as determinants of health and disease is a relatively young but rapidly developing field, in which cutting edge biological technologies are combined with psychological research techniques. Because many diseases develop throughout the life span, the relevant concepts almost always contain an aging perspective.

The goal of this course is to gain an understanding of the bi-directional pathways between central nervous system processes and health. More specifically, we will analyze research investigating the associations of factors such as acute and chronic stress, depression, anxiety, and traumatic stress, with diseases of the cardiovascular system, the metabolic system, and the immune system. We will also work to an understanding of mechanisms in the central nervous system that underlie the relevant psychosocial states, of the pathways that are involved in communication between the central nervous system and the periphery of the human body, and finally, of the affected target tissues and organ systems in the body.

**Learning Goals:** The course will help gain scientific knowledge and research skills, through intensive reading and discussion of original research papers, which leads to the design of an experiment and the writing of a research proposal. This will also help developing critical thinking skills. The requirement of at least one oral presentation of an original research paper will further help develop oral communication skills. Students who might find this course valuable would be neuroscience and psychology students, students interested in clinical psychology and psychopathology, and students in HSSP.

Sources will be book chapters, original research articles, and overview articles explaining basic concepts from the areas of Behavioral Neuroscience, Neuroendocrinology and Neuroimmunology.

### Prerequisites

One of the following: NPSY 11b, NBIO 146a, PSYC 38a, or NPSY 199a
Course Requirements

Readings

Required articles and book chapters will be available through LATTE. Please complete the reading on or before the class date listed in the syllabus.

- see Course Schedule and Topics and List of Readings.
- Each student will be required to submit response “blurbs” of 250 words for each class as a summary of the required readings (required readings are marked as such)
- Each blurb will have to contain one discussion question for each of the required readings to facilitate class discussion
- Blurbs with discussion questions will have to be uploaded to a dedicated LATTE location (will be announced in class)

Class presentation

During each class, two or three students will present the findings of one of the required readings of the respective day as a 10-min oral presentation similar to a conference presentation. You may use Power Point or any other mode of presentation, but you are strongly encouraged to visualize your presentation.

- Each team of presenters will meet with the instructor a week before the presentation, during the instructor’s office hours.
- Each presenting student will be required to take a leading role in the discussion of the paper he/she presented, which will be aimed at ensuring complete understanding of the respective reading and its implications.

Quizzes

Two quizzes will be given; one closer to the beginning and one closer to the end of the semester (see Course Schedule). These quizzes will take up 20 minutes of the beginning of the respective class session, and consist of open answer / super-short-essay questions aimed at testing your understanding of the concepts that have been discussed or presented in class, or have been part of the assigned readings (meaning that anything that is part of already completed required readings might be on each of the tests).

Class participation

Class participation will be graded and includes the following:

1. Attendance
2. Timely completion of reading assignments (by the date listed in the syllabus),
3. Thoughtful contribution to class discussions. To facilitate discussion, each participant is required to prepare at least one discussion question for each of the required readings (see also response blurbs).

Experiential Learning Component

This class will include an experiential learning (EL) component, which translates to “Learning by Doing”. Since we will be talking about stress, and you will all be doing something stressful – i.e. giving a presentation in front of a group of people – we will use the opportunity that this natural experiment creates. In more detail:

- We will take saliva samples before and after each one of your presentations (we will talk about adequate numbers and collection times after our “basic concepts” meeting)
- We will decide if we want to collect anything else (measurement of stress, anxiety, emotions with questionnaires, for example)
- We will thereby collect individual biological data over the course of the semester
We will analyze saliva-based stress markers in small-group sessions in the wet lab in the second half of the semester under the instructor’s guidance.

We will aggregate data and run statistical analyses in class during one of the last class meetings.

One-pagers

Each student will write two one-page essays over the course of the term. Each essay aims to deepen the understanding of one of the course topics by formulating a research question and by trying to answer this question.

(1) The first essay will be a review of research articles. It must be based on original scientific articles (at least 2 articles, no “review” articles or other secondary or tertiary literature), which can be found through your own research (need to be related to one of the course topics, and will need to be approved by the instructor), or can be chosen from the list of required readings. The goal is to pose a research question, argue why it is important to answer this question, and then use original research articles to answer this question (more details in assignment guide).

• Although not an “official form” of writing, one-pagers are frequently asked for by funding agencies or other institutions to get an overview of your planned research, and to give you a recommendation on how to further proceed (e.g. submit a full proposal or not).
• With only one page of space, the message must be communicated in a very clear and precise language, which for many people is more difficult than writing a 10-page essay. The ability to communicate a message a clear and concise way is an important skill.
• One-pagers should not contain quotations / citations, graphical representations, and cannot just be a slight variation of the abstract of a research paper.
• Format (a): Your essay must fit onto one page, using a regular legible font and font size (i.e. not smaller than 11 point), and legible and attractive overall layout. You should use your specific research question as a title, and use the remainder of the page to answer this question by summarizing one or more research articles in your own words.
• Format (b): You should structure this one page using section headings. Examples will be given in the assignment guide.

(2) The second one-pager should be written in the form of a research proposal. This serves as a practice run for your final paper. This will be very similar to the first one-pager, i.e. you will pose a research question, and argue why it is important to answer this question, but instead of using research articles to answer your question, you will suggest a research study designed to answer the question. You will need to use at least two original research articles to support your research question. These articles must be different from the ones used for one-pager #1 (more details in assignment guide).

Each one-pager has to be submitted before each respective deadline (see course schedule for deadlines).

Final Paper

For the final paper, you will identify a research question for which you think that the available literature is insufficient, design a scientific study to fill the specified gaps in the literature, and write a grant proposal that you could theoretically submit to a federal funding agency. You might use one of the one-pagers as a starting point. This grant proposal will consist of a summary of background research findings, the identification of a gap in our knowledge, formulation of one or more hypotheses to test, and a description of the study you would suggest to close the gap in our knowledge.

• I encourage you to identify potential study ideas early in the semester. I suggest that you identify at least one unanswered research question during or after each week’s class.
Specific instructions and guidelines will be given during the semester.

The final paper will have to be written in the format of a R21 grant proposal to the National Institutes of Health (NIH) – see assignment guide for details (this is not APA format).

**Guidelines for all writing assignments**

All writing assignments will have to be submitted to Dr. Juliana Breines (jbreines@brandeis.edu) by email before the respective deadline as a Microsoft Word document. Do not put your names into the documents – use your student ID (SAGE ID) instead.

**Grading**

The various course requirements are worth the following proportions of your final grade:

<table>
<thead>
<tr>
<th>Component</th>
<th>% of final grade</th>
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<tbody>
<tr>
<td>One-pagers</td>
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<tr>
<td>1st one pager:</td>
<td>12.5%</td>
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<tr>
<td>2nd one pager:</td>
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<tr>
<td>Quizzes</td>
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<td>1st quiz:</td>
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<td>2nd quiz:</td>
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<td>Class contributions</td>
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<tr>
<td>Participation</td>
<td>12.5%</td>
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<tr>
<td>Presentation</td>
<td>12.5%</td>
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<tr>
<td>Final Paper</td>
<td>25%</td>
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**LATTE**

A copy of this syllabus will be available on LATTE. Readings will be uploaded to LATTE before class. Presentations will be made available on LATTE after each class. The instructor will use LATTE’s grading capabilities so that you will be able to check your grades online.

**Late Work and Extensions**

Papers submitted after the deadline will be penalized by lowering the grade by 10 percent points for each day late. If you have some extenuating circumstances that would make it impossible for you to hand in an assignment on time, please talk to the professor before the deadline to see if he can arrange a reasonable extension plan.

**Special Needs**

If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately.

**Academic Honesty**

You are expected to be honest in all of your academic work. The University policy on academic honesty is distributed annually as section 5 of the Rights and Responsibilities handbook. Instances of alleged dishonesty, including plagiarism, will be forwarded to the Office of Campus Life for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about my expectations, please ask.
Regrading Policy

If you believe that a mistake has been made in the grading of a paper, you may ask for a re-grade. This request must be made in writing and must include a justification in writing of why you believe that a re-grade is warranted. Written requests must be submitted to the professor within 1 week of when you receive your grade for that paper. Once you turn in a written request, a re-grading of your entire paper/exam will be done. Any mistakes in grading (either in your favor or against you) will be corrected. This means that any time you ask for a re-grade, it is possible for your grade to go up, go down, or stay the same.
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<thead>
<tr>
<th>#</th>
<th>date</th>
<th>Topic / Schedule</th>
<th>deadlines / events</th>
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<tbody>
<tr>
<td>1</td>
<td>Jan 15</td>
<td>Intro to NPSY141: Organizational Meeting</td>
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<tr>
<td>2</td>
<td>Jan 22</td>
<td>(1) topic #1: Basic Concepts (NR)</td>
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<td>(2) EL component: Study Design (all)</td>
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<td>(3) preparation topic #2 (NR)</td>
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<td>3</td>
<td>Jan 29</td>
<td>(1) topic #2: Stress Circuits in the CNS: presentations 1 &amp; 2 &amp; 3</td>
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<td>(2) preparation topic #3 (NR)</td>
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<td>4</td>
<td>Feb 05</td>
<td>(1) topic #3: Stress responsive systems in the periphery: presentation 4 &amp; 5 &amp; 6</td>
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<td>(2) preparation topic #4 (NR)</td>
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<td>5</td>
<td>Feb 12</td>
<td>(1) Quiz #1</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; quiz</td>
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<td>(2) topic #4: Acute stress effects on the CNS: presentation 7 &amp; 8 &amp; 9</td>
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<td>(3) preparation topic #5 (NR)</td>
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<td>6</td>
<td>Feb 19</td>
<td>Midterm recess – no class</td>
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<td>7</td>
<td>Feb 26</td>
<td>(1) topic #5: Stress to disease over the life span – biological effects: presentation 10 &amp; 11 &amp; 12</td>
<td>Friday, Feb 28, 5pm: 1&lt;sup&gt;st&lt;/sup&gt; one-pager due</td>
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<td>(2) preparation topic #6 (NR)</td>
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<td>8</td>
<td>Mar 05</td>
<td>(1) topic #6: Stress to disease: long-term / life span – cognitive effects: pres. 13 &amp; 14 &amp; 15</td>
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<td>(2) How to write a research grant proposal</td>
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<td>(3) preparation topics #7&amp;8 (NR)</td>
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<td>9</td>
<td>Mar 12</td>
<td>EL component: wet lab (no class meeting!)</td>
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<td>group-wise schedule for presenters 1 to 4 (group 1) and 5 to 8 (group 2)</td>
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<td>10</td>
<td>Mar 19</td>
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<td>(1) topic #7: inflammation as bi-directional pathway – CNS to periphery: presentation 16 &amp; 17 &amp; 18</td>
<td>Friday, March 28, 5pm: 2&lt;sup&gt;nd&lt;/sup&gt; one-pager due</td>
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<td>(2) EL component: wet lab 9 to 12 (group 3)</td>
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<td>11</td>
<td>Mar 26</td>
<td>(1) topic #8: inflammation as bi-directional pathway – periphery to CNS: presentation 19 &amp; 20</td>
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<td>(2) EL component: wet lab 13 to 16 (group 4)</td>
<td>Friday, April 02, 5pm: 2&lt;sup&gt;nd&lt;/sup&gt; one-pager due</td>
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<td>12</td>
<td>Apr 02</td>
<td>(1) topic #9: Affective Disorders and Health: presentation 21 &amp; 22</td>
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<td>(2) EL component: wet lab 17 to 20 (group 5)</td>
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<td>EL component: wet lab 21 to 24 (group 6) to be scheduled outside regular class times between April 02 and April 09 (#23 and #24 will be given the opportunity to work on alternative saliva samples)</td>
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<td>13</td>
<td>Apr 09</td>
<td>(1) Quiz #2</td>
<td>Quiz #2</td>
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<td>(2) topic #10: Prevention or amelioration of the health consequences of stress presentation 23 &amp; 24</td>
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<td>(3) EL component: data aggregation and analysis</td>
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<td>Passover and spring recess – no class</td>
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<td>14</td>
<td>Apr 23</td>
<td>Wrap-up &amp; Summary</td>
<td>Sunday, May 04, midnight: Research Grant (final paper) due</td>
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List of Readings

Usually, up to four original research papers, book chapters, or review papers will be assigned for each class. ALL readings will be made available through LATTE.

Please note that the required readings might be updated up to two weeks before each class meeting to allow for inclusion of cutting edge research

Literature that has NOT been updated yet is highlighted yellow

1. Basic Concepts

In this first section we will focus on the most important concept mediating between psychosocial factors and disease: stress. We will study the development of stress concepts, from physiology-focused explanations to truly psychological concepts, which include hypotheses about specific cognitive and emotional processes.

Required readings:

Additional reading – not required, just recommended as an add-on throughout the semester:

2. Stress circuits in the central nervous system

In this section, we will analyze how emotions, particularly those relevant to stress-related disorders, are processed within the central nervous system to elicit a stress response.

Required readings:
Additional reading – not required, just recommended:

3. Stress-responsive systems in the periphery of the body
To understand the association between states of the central nervous system and diseases of the periphery of the body, we need to learn about the pathways connecting the CNS with the periphery. The CNS reaches out the periphery of the body through neural pathways, and through the secretion and reception of endocrine signals. The two major stress systems of the body are part of the neural system (i.e. the sympathetic nervous system) and of the endocrine system (i.e. the hypothalamus-pituitary-adrenal axis). Both systems communicate states of threat or danger to the periphery of the body. In addition, the CNS is able to receive signals from most peripheral organ systems through similar pathways. Of particular relevance is the immune system, which is connected to the CNS through endocrine and neural pathways, and is an excellent example of bidirectional communication of periphery and CNS.

Required readings:

4. Acute stress effects on the CNS
In addition to being started in the CNS, stress responses also induce profound changes in the CNS, either directly, by intra-CNS pathways, or indirectly, by secondary mediators of peripheral stress responses feeding back into the CNS. One example of the latter effects is modulation of human memory by the stress hormone cortisol.

Required readings:

5. How can stress lead to disease: life span perspective: Biological Effects
One of the most important conclusions from the previous section is that acute stress, threat or challenge induce major changes in the states of the CNS and the periphery, but also that these changes are highly adaptive in the short term, and necessary for survival. In section 5 and 6 of the course we will analyze research that tries to understand which conditions need to be fulfilled for psychosocial factors being associated with central and peripheral pathophysiological processes and disease. We will find that one of the requirements is long-term exposure to adverse psychosocial factors, which necessarily includes a life-span or aging perspective. Many
of the diseases that are connected to stress-related factors are also classified as age-related
diseases, because they require long-term exposure to psychosocial or behavioral risk factors.

**Required readings:**

**Background Readings (recommended, but not required):**

6. **How can stress lead to disease: life span perspective: Cognitive and CNS Effects**
This section asks similar questions as the above, only that here the focus is on effects on the function of the central nervous system, mainly cognition.

**Required readings:**

7. **Inflammation as a bidirectional pathway between CNS and periphery: CNS to periphery**
In this section of the class, we will develop a deeper understanding of one of the most promising pathophysiological communication pathway currently studied. Inflammation can be a healthy response to infection with a pathogen, but the same mechanism is frequently activated without a specific pathogenic stimulus, in which case its adaptive mechanisms are turned into maladaptive threats to our health.

**Required readings:**
8. Inflammation as a bidirectional pathway between CNS and periphery: periphery to CNS

**Required readings:**


9. Affective Disorders and Health

Affective disorders such as Major Depression, anxiety disorders, and posttraumatic stress disorders are among the most prevalent diseases of the 21st century. They are not only a significant burden for the patient, but also for society. Affective disorders are associated with increased risk for severe somatic diseases such as cardiovascular diseases, type 2 diabetes, the metabolic syndrome and osteoporosis. Current research is beginning to uncover the pathways connecting these pathways with diseases.

**Required readings:**


**Background Reading (recommended, but not required):**


10. How can we use the current findings to prevent or ameliorate the health consequences of stress?

While most of the earlier work focused on how negative CNS states could lead to negative health outcomes, recent research has pointed in the opposite direction. Currently, an increasing number of researchers are asking the question how the current findings can be turned around and used in prevention and treatment. In fact, mounting evidence shows that treatments such as stress management training or meditation are effective in reducing acute stress responses, but also in helping people with fatal diseases such as AIDS or cancer live longer.
Required readings:

Optional readings (reviews and further original studies):