Department of Psychology - Columbia University

Fundamentals of Human Neuropsychology

UN2470/ Course Syllabus / Fall 2021

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Prerequisites

PSYC UN1001 The Science of Psychology, or an equivalent introductory course in psychology.

Learning Objectives

At the end of this course students will be able to:

1. Summarize the major assumptions that underlie the study of brain-behavior relationships;
2. Differentiate among major neuropsychological disorders and describe how they present to clinicians at both early and late stages of the disease
3. Evaluate the best assessment practices used by clinical neuropsychologists, through identifying inconsistencies and fallacies with current diagnostic processes.
4. Generate innovative diagnostic approaches using the current technology for the diagnosis and rehabilitation of patients with neuropsychological disorders.

Full Description

Before the advent of functional neuroimaging and noninvasive brain stimulation methodologies, the identification of brain areas subserving specific cognitive functions was mostly based on the evaluation of clinical deficits in neurological patients and post-mortem analysis of lesions present in their brains. Although the rapid development of neuroimaging techniques has greatly contributed to the understanding of the relationship between brain and behavior, its correlational nature poses hard theoretical limits to the conclusions that can be drawn from these studies. At the same time, the clinical neuropsychology field has fruitfully exploited the advantages provided by these methodologies, to localize in vivo and non-invasively gray and white matter lesions in neurological patients. In the past twenty years, the analysis of lesion patterns extended across brain networks has offered invaluable insights on the relationship between brain and behavior and deepened our understanding of the causal relationships between brain lesions and their clinical consequences. This course stems from these

theoretical premises and constitutes a voyage in the structural and functional knowledge grown from the study of patients with naturally occurring focal lesions and includes an overview of the most common rehabilitation techniques used in clinical neuropsychology practice.

Role of PSYC UN2470 in the curriculum

PSYC UN2470 is an intermediate-level lecture course, open to undergraduates and students in the Post-baccalaureate Psychology program. It fulfills the following degree requirements:

- For the Neuroscience & Behavior major, this course can be used to fulfill either the P2 or P4 requirement (not both).
- For the Psychology major and concentration, and for the Post-baccalaureate Psychology program, this course meets the Group II – Psychobiology & Neuroscience – distribution requirement.

Course website

The most up-to-date information, including changes to the syllabus or to the class schedule, announcements, lecture slides and additional materials are contained on the course website on CourseWorks (Canvas). Be sure you are familiar with it, that you are easily able to login to the website, and that you always have the lecture slides with you (whether printed or electronic). If you have problems accessing the course website at any point during the semester, please let me know.

Readings

- *Suggested Textbook*: Fundamentals of Human Neuropsychology, by Bryan Kolb and Ian Q Whishaw. MacMillian Education, 7th Edition, 2015. Various copies of the book are on reserve in the library. Yet, activities of the course are organized in a way that you are not "required" to have a copy of the book (flipped classroom, more info about).

- *Additional readings will be provided by the instructor and will be available on Canvas*
    - Clinical Neuropsychology, by Kenneth M Heilman, Edqard Valenstein. Oxford University Press, 5th Edition, 2012.
    - Principles of Neural Sciences, by Hudspeth, A. J., Jessell, T. M., Kandel, E. R., Schwartz, J. H., & Siegelbaum, S. A. (Eds.), 4th Edition, (2013).
    - Code, C., Wallesch, C. W., Joanette, Y., & Lecours, A. R. (Eds.). (1996). Classic cases in neuropsychology. Psychology Press.

Class Activities: what is a "flipped" course?

This is a hybrid (aka "flipped") course. Therefore, rather than depending mostly on the exams, your grade will be based on the following activities: offline learning, active learning (in-class participation and group projects) and formal assessments (exams and the final written assignment).

Offline Learning

Each week, a series of video lectures related to the weekly topic will be posted on Courseworks. Students are expected to watch the videos on their own and complete quizzes prior to the first class of

each week. Students can take quizzes as many times as they need and will only be graded on the final score. If any material is unclear or requires more explanation from the videos, students may submit questions and comments prior to class on Monday on the *Muddiest Points* section on Coursework, Muddy points will be reviewed at the beginning of each class.

Active Learning

One of the goals of this course is to facilitate student engagement through experiential learning. Active engagement will be promoted by:

- In-Class Experiment: students will review neuropsychological cases and will work in groups to collect and analyze data, discuss results, and relate them to the scientific literature.
- Students will have a chance to speak to guest speakers with extensive experience in the topic to guide their discussion

Formal assessments 1: Exams

Exams will be a mix of multiple choice, fill-in, and short-answer questions. The majority of each test will focus on material covered in the lectures, and the corresponding sections in the textbook.

- While studying, try to emphasize *understanding* and *critical thinking*.
- Knowing key concepts and definitions is highly valued, of course, but successful students use that knowledge to scaffold a more comprehensive understanding of the material.
- Rather than simply "memorizing," try to "understand" the material and consult with your Instructor and the TAs for clarification.
- Test questions will include more basic definitional / conceptual knowledge as well as application of that knowledge to new scenarios.
- Videos (with subtitles), transcripts of the videos, and slides in the videos will be posted on Courseworks; additional readings (including the case studies that will be discussed in class) will be also posted on Courseworks and may constitute material you will be tested on during the exam.

Make-up exams: will be allowed only with written justification (e.g., by your doctor or advising dean) and must be taken within one week after the exam.

Formal Assessments 2: **Written Assignment**

Good writing is good thinking, and a primary goal of this assignment is to help students enhance writing and critical thinking skills by deepening their understanding of a course-related topic of their choice.

Most students are not familiar with scientific writing, which is why in-class activities include sessions designed to dive into four key points related to this task: 1. Identifying a topic; 2. Creating a draft; 3. Get comments from colleagues and peers (aka peer review); and 4. Submitting your final work.

1. **Topic Proposal** (deadline Week 5 – Sunday October 10th at 11:59PM): Early in the course students will be asked to identify a topic they want to learn more of. The topic must be related to the class content.

- Submissions can be as simple as a one-page summary of the planned literature search. Remember to clearly state the topic you are planning to work on, and you can start with a *title*.
- Add a reason why you would like to learn more about a topic: what motivates you? Why do you find it interesting?
- At the bottom of the page, list at least 4/5 references you are going to read.
- To find relevant articles for your topic proposal, databases recommended are Pubmed, Google Scholar, or simply look at the "Publications" sections of the various Clinical Neuropsychology at CU and beyond – refer to an attachment called List of Researchers for the Writing Assignment – Short Paper) to find a recent and exciting empirical paper in the current neuropsychology literature. Note: review papers are NOT a good fit for this assignment. So, avoid picking a review paper to write your own review.
- The Proposal must be submitted on Courseworks Assignment Page. The Instructor and the TA will promptly approve the topic or give some suggestions for changes if needed (e.g., if the topic chosen does not fit with the course's content).

2. **First Draft** (deadline week 7 – Tuesday October 27th at 11:59PM): Once your topic is approved, students can begin work on a first draft of the paper. Generally, it consists of a 5–7-page manuscript (excluding references).
    - Even though you will be working on a "draft", you might want to submitted a version of the writing assignment that is *as close as possible* to the final submission. Why? Because the closer to a complete submission your draft is, the higher the chance that you will receive good feedback from your peers. In other words, your first draft *can* be as simple as a bullet points list, but it is highly likely that the feedback you will receive on your draft won't be as extensive as if you had a full drafted manuscript. Think about it while you write your draft.
    - The Teaching Team will NOT provide comments and suggestions on the first draft. See below.

3. **Peer review** (deadline week 12 – Sunday November 28th at 11:59 PM): In order to make this activity also an opportunity for students to actively learn, one of the steps in the revision process will be a round of "peer review," in which each student will be asked to review the drafts of at least two of their colleagues.
    - This will put each student in the position of the "reviewer," by critically analyzing and understanding pitfalls, shortcomings, but also strengths of the writing of their peers; this is expected to influence also the student's own writing by adjusting the focus and clarifying potential issues.
    - Students will be randomly assigned to anonymously peer review the drafts written by two other students.
    - Comments and suggestions from the peer-review process should be appropriately considered when writing the final paper, based on the student's judgment. Students will be on the feedback provided to other students.

- Make sure you provide valuable feedback to your peers in order to get full points on the final writing assignment. In order to help you, we have a rubric on Coursework about *how to give effective feedback*, and we will also do some exercises in class to practice with Peer Review.

4. **Final submission on Courseworks** (deadline week 13 – Sunday December 12th at 11:59PM): The final draft of the paper will be graded not only as a standalone paper but also in how it demonstrates improvement upon the earlier draft, as well as their ability to incorporate the feedback into their work.

Format for the Final Submission:

- Provide a Title page, including the title, the author (i.e., your first and last name), institution, 5 keywords.
- An Abstract: a max of 250 words summarizing your work.
- Page length: between 5 and 10 pages, including title page and abstract, but excluding references;
- Double spaced;
- One-inch margins.

Grades

- Active Learning: 20% of the final grade
  - In-class experiments (5%)
  - Groups work (5%)
  - PollEverywhere weekly responses (5%)
  - Weekly Knowledge Check (5%)
- Formal Assessments 1: Exams: 50% of the final grade (20% exam 1, 30% exam 2)
- Formal Assessments 2: Written Assignment: 30% of the final grade
  - Choice of the topic (5%)
  - First Draft (10%)
  - Peer – review Feedback (20%)
  - Final Submission (65%)
    - Timely submission of the final writing (5%)
    - accurate formatting (5%)
    - Incorporate the comments received by peers and by TAs in the final submission (5%)
    - Quality of the writing of the final assignment (50%)

Letter Grade Assignment

A+: 97-100	**A:** 94-96	**A-:** 90-93
B+: 87-89	**B:** 84-86	**B-:** 80-83
C+: 77 - 79	**C:** 74-76	**C-:** 70-73
D: 60 - 69	**F:** <60	

Class policies: Important Information below – please read carefully!

Disability Services: In order to receive disability-related academic accommodations for this course, students must first be registered with their school Disability Services (DS) office. Detailed information is available online for both the Columbia and Barnard registration processes. Refer to the appropriate website for information regarding deadlines, disability documentation requirements, and drop-in hours (Columbia)/intake session (Barnard).
For this course, Columbia students are not required to have testing forms or accommodation letters signed by faculty. However, students must do the following:

1. The instructor section of the form has already been completed and does not need to be signed by the professor.
2. The student must complete the student section of the form and submit the form to Disability Services.
3. Master forms are available in the Disability Services office or online: https://health.columbia.edu/services/testing-accommodations

Religious observances: If you are going to miss class(es) due to religious holidays, you must notify me during the first week of class so that accommodations may be made.

Sexual Respect: Any form of gender-based misconduct will not be tolerated. Columbia University is committed to fostering an environment that is free from gender-based discrimination and harassment, including sexual assault and all other forms of gender-based misconduct. Visit this website for more information: http://sexualrespect.columbia.edu/

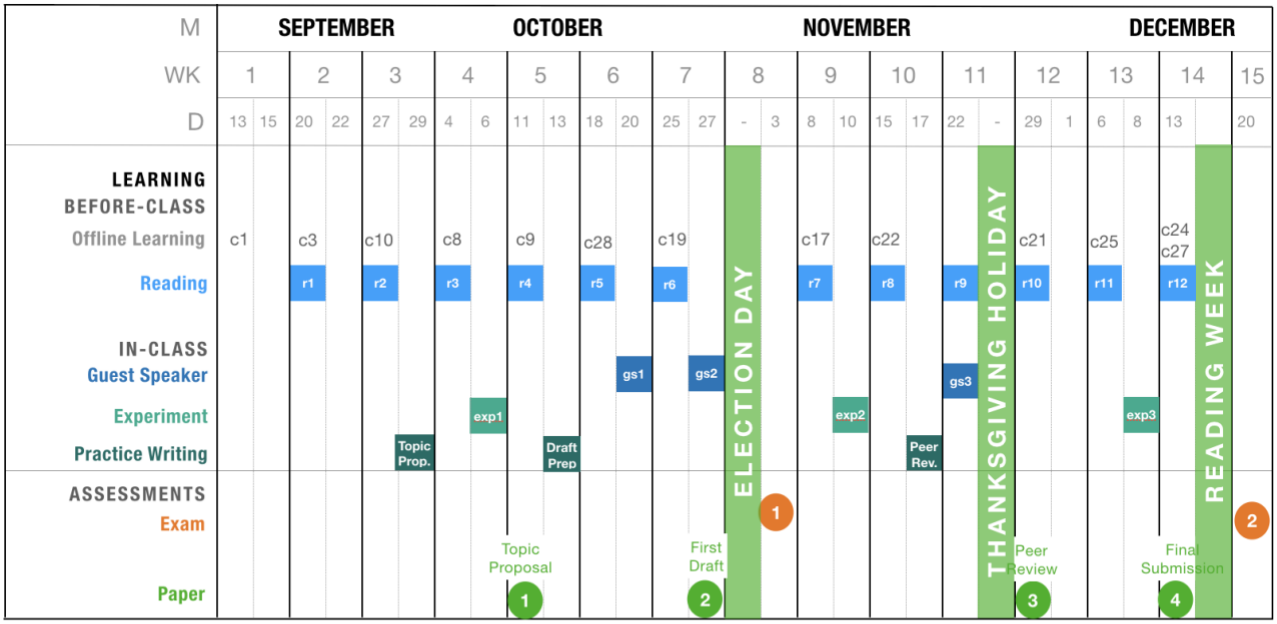
Academic integrity: As members of this academic community, we are responsible for maintaining the highest level of personal and academic integrity: "Each one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity. The exchange of ideas relies upon a mutual trust that sources, opinions, facts, and insights will be properly noted and carefully credited. In practical terms, this means that, as students, you must be responsible for the full citations of others' ideas in all of your research papers and projects... [and] you must always submit your own work and not that of another student, scholar, or internet agent" (from the Columbia University Faculty Statement on Academic Integrity) http://www.college.columbia.edu/academics/academicintegrity .

Cheating and plagiarism – whether intentional or inadvertent – is a serious violation of academic integrity. Plagiarism is the practice of claiming or implying original authorship of (or incorporating materials from) someone else's written or creative work, in whole or in part, without adequate acknowledgement. If you have any questions about what constitutes plagiarism and/or how to properly cite sources, please come to me. I am more than happy to help. Similarly, if you put yourself in a situation in which you think your best option might be to cut some corners, see me. If you feel like you are falling behind, don't understand the material, or are not confident about your ability to take tests, talk to me as soon as possible instead of taking measures that go against principles of academic integrity. We are here to learn, not to merely judge. It is a far better option to come talk to me than compromise your academic integrity and potentially put your academic standing in jeopardy.

Attendance: Coming to class is meaningless if class time is spent inappropriately. Chatting with friends, watching videos online, and browsing social media are not appropriate activities for the classroom. Also, remember to silence your cell phone before class. Generally, eliminate distractions as much as possible to respect your classmates, as well as increase your chance of staying focused and learning the material during class.

Schedule

The calendar below details topics, readings, and assignments for each class period. Students are responsible to be prepared to discuss the assigned readings for each class period.



Ch 1: Intro
Ch 3: Nervous system organization
Ch 10: Principles of neocortical functions
Ch 8: Organization of the sensory systems
Ch 9: Organization of the motor systems
Ch 28: Neuropsychological assessment
Ch 19: Language Disorders
Ch 17: Cortical networks and disconnection syndromes
Ch 22: Hemispatial neglect and attentional deficits
Ch 21: Spatial behaviors, place cells, and grid cells
Ch 25: Plasticity, recovery, and rehabilitation
Ch 19: Psychiatric, neurological disorders

W	DATE	TOPIC	READINGS	NOTES
1	Sept 13 (M) Sept 15 (M)	Introduction (ch 1)		
2	Sept 20 (M) Sept 12 (W)	Nervous system organization (ch 3)	R1. Coltheart 2017 - The assumptions on which Neuropsychology stands.pdf	
3	Sept 27 (M) Sept 29 (W)	Principles of neocortical functions (ch 10)	R2. Vaidya et al 2020 - Lesion studies in Contemporary Neuroscience.pdf	Topic Proposal Practice
4	Oct 4 (M) Oct 6 (W)	Organization of the sensory systems (ch 8)	R3. Hilgetag and Goulas 2020: Hierarchy in the organization of brain networks.pdf OR Thorudottir et al 2020 - The Architect Who Lost the Ability to Imagine: The Cerebral Basis of Visual Imagery.pdf	Experiment 1

5	Oct 11 (M) Oct 13 (W)	Organization of the motor systems (ch 9)	R4. Parkin et al 2015 - Neuron - Non-invasive Human Brain Stimulation in Cognitive Neuroscience A Primer OR Fornia et al 2020. Direct electrical stimulation of premotor areas: different effects on hand muscle activity during object manipulation.pdf	Deadline for Topic Proposal Submission on Canvas First Draft Practice
6	Oct 18 (M) Oct 20 (W)	Neuropsychological assessment (ch 28)	R5. Jones et al 2020: Neuropsychological assessment the not-so-basic basics.pdf OR Poldrack 2006: Can cognitive processes be inferred from neuroimaging data?	Guest Speaker 1
7	Oct 25 (M) Oct 27 (W)	Language disorders (ch 19)	R6. Villar-Rodríguez, et al 2020. Left-handed musicians show a higher probability of atypical cerebral dominance for language. *Human Brain Mapping*, *41*(8), 2048-2058.	Guest Speaker 2 - Deadline for First Draft Submission on Canvas
8	Nov 1 (M)	**Election Day, University Holiday**		
	Nov 3 (W)	**Exam 1: on chapters 1, 3, 10, 8, 9, 28, 19**		
9	Nov 8 (M) Nov 10 (W)	Cortical networks and disconnection syndromes (ch 17)	R7. Takemura & Thiebaut DeSchotten 2020: Perspectives given by structural connectivity bridge the gap between structure and function	Experiment 2
10	Nov 15 (M) Nov 17 (W)	Hemispatial neglect and attentional deficits (ch 22)	R8. Toba, M. N., Pagliari, C., Rabuffetti, M., Nighoghossian, N., Rode, G., Cotton, F., ... & Bartolomeo, P. (2021). Quantitative assessment of motor neglect. Stroke, 52(5), 1618-1627.	Peer Review Practice
11	Nov 22 (M)	Hemispatial neglect (cont'd)	R9. Adolphs et al 2020 - Human Lesion Studies in the 21st Century	Guest Speaker 3
Thanksgiving, University Holiday				
12	Nov 29 (M) Dec 1 (W)	Spatial behaviors, place cells, and grid cells (ch 21)	R10. Thorudottir et al 2020 - The Architect Who Lost the Ability to Imagine: The Cerebral Basis of Visual Imagery.pdf	Deadline for Peer Review Submission on Canvas
13	Dec 6 (M) Dec 8 (@)	Plasticity, recovery, and rehabilitation (ch 25)	R11. Bilder 2019 - Clin Neuropsych - Neuropsychological Tests of the Future - How Do We Get There from Here.pdf	Experiment 3
14	Dec 13 (M)	Psychiatric, neurological, and neurodevelopmental disorders (chs 24& 27)	R12. Bartolome & de Schotten 2016. Let thy left brain know what thy right brain doeth: Inter-hemispheric compensation of functional deficits after brain damage.pdf	
15	Dec 20 (M)	**Exam 1: Cumulative (Lectures, Guest Speakers, and Experiments)**		