

Psychology G4460
Cognitive Neuroscience in the Media
Fall 2015

Daphna Shohamy
ds2619@columbia.edu

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I. Bulletin description

G4460. Cognitive Neuroscience in the Media (seminar).

4 pts. W 2:10 - 4 PM. Room 200C Schermerhorn Hall.

Prerequisites: Courses in introductory psychology and neuroscience and the instructor's permission.

This seminar will discuss recent topics in cognitive neuroscience and how research in this field is impacting public opinion. We will engage in a critical review of how the media represents research on the brain, with a focus on current issues and controversies related to the use of neuroimaging in the study of brain and behavior in humans.

II. A full description of the content of the course

Recently, cognitive neuroscience findings have received much attention in the press. Media coverage of neuroscientific findings often emphasizes how the brain contributes to complex human behaviors such as memory, decision-making, and emotional and social interactions, with implications for many aspects of society, including health care, politics, art, and law. This coverage by the popular press is, in turn, having a growing impact on the research itself.

This seminar will survey how the popular press is representing recent literature in the cognitive neuroscience of human behavior, with two main aims. First, we will examine trends in the content of the research that is covered. What topics are most often represented, and why? Second, we will engage in a critical examination of how the press coverage relates to the scientific findings, with a special emphasis on the strengths and limitations of cognitive neuroscience methods. Are there discrepancies between the media coverage and the original research report? Were the strengths and limitations of the original study

conveyed accurately in the media coverage? Throughout this process, we will gain a critical view of current topics and methods in cognitive neuroscience and their implications for our society.

Each weekly meeting will address a question in the field, its coverage by a recent article in the popular press, and the original research article. Each meeting will begin with introductory comments by the professor about the background and relevance of that week's topic, followed by a student presentation of the original empirical journal article and a discussion of how the findings were presented in the article in the popular press. Finally, we will together consider how the data presented inform our understanding of that week's topic, how the press coverage converges and diverges from the original research article, and how it relates to our understanding of the relation between brain and behavior.

In the first part of the course, we will focus on introducing basic methods and topics in cognitive neuroscience. The course will begin by surveying the broad questions that will be addressed in the seminar. The second and third lectures will provide introduction to the basic principles and methods of studying the brain bases of cognition in humans, with an emphasis on what different methods can, and can not, tell us about the function of the human brain. In the fourth class, we will further discuss basic methods in cognitive neuroscience, this time with a view towards recent media controversies regarding cognitive neuroscience methods. After this detailed introduction to trends, methods and tools of the trade, in the rest of the seminar we will turn to discuss different timely topics in cognitive neuroscience and their representation in the popular press, surveying current trends and a wide array of topics, as detailed below.

III. The rationale for giving the course

There has been a recent surge of interest in the popular press in research aimed at understanding the link between brain and behavior, with important implications for many aspects of society. This course aims to provide students with the tools to critically evaluate the way in which cognitive neuroscience data is presented in the media while offering an opportunity for students to learn about important findings in the emerging field of cognitive neuroscience.

PSYC G4460 will fulfill the following degree requirements:

- For Psychology Graduate Students, PSYC G4460 will apply toward the “two seriously graded seminars” requirement of the Master’s degree.
- For the Psychology major or concentration in CC and GS, for the Psychology minor in Engineering, and for the Psychology Post-bac, PSYC G4460 meets the Group II (Psychobiology and Neuroscience) distribution requirement.

- For the Neuroscience and Behavior joint major, G4460 will fulfill the 5th Psychology requirement: “one advanced psychology seminar from a list approved by the Psychology Department advisor to the program.” [requires approval of the advisors to the major]
- For the Psychology post-bac certificate, PSYC G4460 will fulfill the 7th (advanced seminar) requirement.
- For the science requirements of the College and GS, G4460 will fulfill one term of the requirement, provided that students have completed the prerequisite and obtain the necessary permission. Students who are majoring in Psychology or in Neuroscience and Behavior will have priority over students who are taking the course for the science requirement, and we anticipate that the course will rarely be used for the latter.
- For the Barnard Psychology major, PSYC G4460 will fulfill the senior seminar requirement.

IV. The reading list and weekly syllabus

Readings will consist of scientific papers (both empirical and review articles) and of articles from popular media. All scientific papers are available as downloadable pdfs by searching the PubMed archive at: <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>. All media articles will be available through Courseworks. The following are a sample, subject to revision to represent more recent publications.

Course Schedule

Week 1 (9/9): General Introduction

Week 2 (9/16): How do we study the link between brain and behavior (I)?

Basic methods in brain research I: Animal studies and human neuropsychology. We will discuss the historical development and the strengths and limitations of each of these methods for informing our understanding about how the brain supports cognition and behavior.

Principles of Cognitive Neuroscience, by Dale Purves et al., (Sinauer Press, 2008). Chapter 3: Exploring cognitive processes in neural terms; pp 34-61.

How do we study the link between brain and behavior (II)?

Basic methods in brain research II: Functional imaging in humans. We will discuss the basic principles of functional brain imaging in humans, its advantages and disadvantages, and the importance of converging evidence.

Functional Magnetic Resonance Imaging, by Scott Huettel and Allen Song.
Chapter 1: An introduction to fMRI; pp 1-26
Chapter 15: Converging operations; pp 429-466.

Week 3 (9/23): No Class (Yom Kipur)

Week 4 (9/30): Controversy in the press: What precisely can brain imaging tell us?

Functional imaging of voting preferences (or: how *not* to use fMRI to understand the mind). We will discuss principles of functional MRI and will examine an example of how these principles are violated, driving invalid conclusions about brain and mind in a political context.

This Is Your Brain on Politics, The New York Times, Iacoboni et al., OP-ED
<http://www.nytimes.com/2007/11/11/opinion/11freedman.html?ex=1352437200&en=e0ca987ad4bd515f&ei=5090&partner=rssuserland&emc=rss>

Response: Politics and the Brain, The New York Times,
<http://www.nytimes.com/2007/11/14/opinion/lweb14brain.html>

Mind Games, Editorial in Nature;
<http://www.nature.com/nature/journal/v450/n7169/full/450457a.html>

Poldrack, R. A. (2008). The role of fmri in cognitive neuroscience: Where do we stand? *Curr Opin Neurobiol*, 18(2), 223-227.

Week 5 (10/7) Controversy in the press: Can brain imaging tell us anything?

Media responses to the limitations of functional imaging. We will discuss a recent controversial paper delineating methodological limitations of functional imaging, and will examine the impact of this paper in the popular press.

Of Voodoo and the Brain, Newsweek Feb. 9, 2009
<http://www.newsweek.com/id/182570>

Vul, E., Harris, C., Winkielman, P., & Pashler, H. (2009) "Voodoo correlations in social neuroscience". *Perspectives on Psychological Science*, 4(3):274-290.

Lieberman, M. D., Berkman, E.T., & Wager, T.D. (2009) "Correlations in Social Neuroscience aren't Voodoo: A reply to Vul et al. *Perspectives on Psychological Science*, 4(3):299-307.

Week 6 (10/14): What do images of imaging do to the brain?

Recent studies have begun examining how brain pictures impact memory and judgment, and how this relates to scientific impact, both within the field and

outside it.

McCabe, D.P., Castel, A.D. (2008). Seeing is believing: The effect of brain images on judgements of scientific reasoning. *Cognition*, 107:343-52.

Poldrack, R. A. (2006). Can cognitive processes be inferred from neuroimaging data? *Trends Cogn Sci*, 10(2), 59-63.

Beck, D. (2010). The appeal of the brain in the popular press. *Perspectives on Psychological Science*, 5:762-766.

Week 7 (10/21): Face Recognition: Is there such a thing as a “grandmother” neuron?

Humans are very good at recognizing faces, yet there is still much debate about the basic brain processes that underlie this ability. We will discuss recent studies of this topic, with a focus on the much debated question of whether there are “grandmother cells” in the brain.

“Brain Cells for Grandmother”, Scientific American, Feb 2013
<http://www.nature.com/scientificamerican/journal/v308/n2/full/scientificamerican0213-30.html>

Suthana, N., & Fried, I. (2012). Percepts to recollections: insights from single neuron recordings in the human brain. *Trends in cognitive sciences*, 16(8), 427-436.

Quiroga, R. Q. (2012). Concept cells: the building blocks of declarative memory functions. *Nature Reviews Neuroscience*, 13(8), 587-597.

Quiroga, R. Q., Kraskov, A., Mormann, F., Fried, I., & Koch, C. (2014). Single-cell responses to face adaptation in the human medial temporal lobe. *Neuron*, 84(2), 363-369.

Week 8 (10/28) Memory Disorders: Is memory important for learning?

Some patients suffer from a very selective loss of memory. Are these patients able to learn and what does this tell us about how the brain works?

“Life Lines”, New Yorker, March 30, 2015
<http://www.newyorker.com/magazine/2015/03/30/an-artist-with-amnesia>

Schapiro, A. C., Gregory, E., Landau, B., McCloskey, M., & Turk-Browne, N. B. (2014). The necessity of the medial temporal lobe for statistical learning. *Journal of cognitive neuroscience*, 26(8), 1736-1747.

Week 9 (11/4): Mind Reading: Can functional imaging detect lies?

Functional imaging data has recently been admitted into the courtroom, stimulating much controversy about “neurolaw” – the relevance of brain imaging data for a wide variety of legal issues. We will focus on how brain imaging has been applied to lie detection.

“Can fMRI Really Tell If You’re Lying?”, Scientific American, July 2008
<http://www.scientificamerican.com/article/new-lie-detector>

Greely, H. T., & Illes, J. (2007). Neuroscience-based lie detection: The urgent need for regulation. *Am. JL & Med.*, 33, 377.

Ganis, G., Rosenfeld, J. P., Meixner, J., Kievit, R. A., & Schendan, H. E. (2011). Lying in the scanner: covert countermeasures disrupt deception detection by functional magnetic resonance imaging. *Neuroimage*, 55(1), 312-319.

Spence, S. A., Hunter, M. D., Farrow, T. F., Green, R. D., Leung, D. H., Hughes, C. J., et al. (2004). A cognitive neurobiological account of deception: Evidence from functional neuroimaging. *Philos Trans R Soc Lond B Biol Sci*, 359(1451), 1755-1762.

Week 10 (11/11): Neuroethics: Can we use neuroscience research to help build better brains?

The increasingly growing field of ‘neuroenhancement’ raises questions at the boundary between ethics and neuroscience. In this class, we will discuss this debate, what it means for neuroscience research and what it means for society.

“The Brain Gain”, The New Yorker, April 27, 2009
http://www.newyorker.com/reporting/2009/04/27/090427fa_fact_talbot

“Can You Build a Better Brain?” Newsweek, January 3, 2011
<http://www.newsweek.com/2011/01/03/can-you-build-a-better-brain.html>

Farah, M.J. and Wolpe P.R. Monitoring and Manipulating Brain Function. New Neuroscience Technologies and Their Ethical Implications,” *Hastings Center Report* 34, no. 3 (2004): 35-45
<http://www.psych.upenn.edu/~mfarah/Neuroethics-BrainFunction.pdf>

Week 11 (11/18): Adolescence and Risky Behavior: What can neuroscience teach us about why teenagers behave the way they do?

Studies looking at the way brain maturation during adolescence may help explain affects risky decision making in teenagers.

“The Terrible Teens”, The New Yorker, August 31, 2015
<http://www.newyorker.com/magazine/2015/08/31/the-terrible-teens>

Chein, J., Albert, D., O'Brien, L., Uckert, K., & Steinberg, L. (2011). Peers increase adolescent risk taking by enhancing activity in the brain's reward circuitry. *Developmental science*, 14(2), F1-F10.

Somerville, L. H., Hare, T., & Casey, B. J. (2011). Frontostriatal maturation predicts cognitive control failure to appetitive cues in adolescents. *Journal of cognitive neuroscience*, 23(9), 2123-2134.

Week 12 (11/25): Thanksgiving (no class)

Week 13 (12/2): The politics, science and ethics of drugs: What can we learn from brain imaging?

“A General In The Drug War”, The New York Times, June 13, 2011
http://www.nytimes.com/2011/06/14/science/14volkow.html?_r=0

Kalivas, P. W., & Volkow, N. D. (2014). The neural basis of addiction: a pathology of motivation and choice. *American Journal of Psychiatry*.

Tomasi, D., & Volkow, N. D. (2011). Functional connectivity hubs in the human brain. *Neuroimage*, 57(3), 908-917.

Week 14 (12/9): Dream Reading: Can The Brain Be Decoded During Sleep?
Human brain imaging appears to provide us tools for reading people's minds. Is this true and what are the ethical implications?

“Scientists Decode Dreams With Brain Scans”, Wired, April 2013
<http://www.wired.com/2013/04/dream-decoder/>

Horikawa, T., Tamaki, M., Miyawaki, Y., & Kamitani, Y. (2013). Neural decoding of visual imagery during sleep. *Science*, 340(6132), 639-642.

Underwood, E. (2013). How to Build a Dream-Reading Machine. *Science*, 340(6128), 21-21.

Week 15 / Make-up class (12/15 @ 1-3 p.m.): Joint class with students from the school of journalism - readings TBD.

V. Course requirements and grading

Requirements

- Class participation: Prior to each class, students are expected to read the assigned papers. Students are encouraged to seek out additional research or theoretical papers that are relevant to the topic as well as additional examples of recent media coverage, and to bring these up during the class discussion. All class participants are expected to actively contribute to the discussion.
- Class presentation: Each student will be responsible for presenting an assigned scholarly research article at least once during the semester. Weekly presentations will be assigned during the first class. Presentations should be concise and critical. The presentation should focus on providing a clear presentation of (a) Question – what is the main question the paper addresses, (b) Methods – how did the researchers address this question (c) Results (d) Critique and Conclusions and (e) How the media coverage portrayed the findings.
- Class discussions will be led by Professor Shohamy, and will incorporate critical evaluations of the news media coverage. Students should come to each class prepared to discuss media coverage of the research article, citing both positive and negative aspects.
- Written assignments:
 - **Opinion/Critical Reviews**: For the second section of the seminar (weeks 8-13), each student will submit a brief written review for two of the classes. The review will focus on one of the empirical papers assigned for class. The review will be no longer than one page, briefly describing your opinion of the topic, how the empirical article addressed it, and how it was covered in the media. What was the main goal of the paper? Did the authors select the optimal method and tools for achieving this goal? Was the paper well represented in the media coverage? What is your opinion on the theory, approach, findings, or conclusion? Students are encouraged to specifically consider how well the research was represented in the media coverage. What aspects of the research were covered well, and what important aspects were either omitted or distorted. Reviews will be submitted by email to Professor Shohamy before the last class of the semester.
 - **Term Paper**: Term papers addressing a question discussed during the seminar will be written as review papers, or, with approval, as research proposals. The final paper will be 8-10 pages long, and will be **submitted by December 16th, at midnight**. The paper will consist of two components. (1) a scientific review of one of the topics covered in class; (2) a 1-2 page 'press release' suitable for publication in the popular media. **Please email me your proposed**

topic, and a list of 5-10 scientific articles that you will be drawing on, at least one week before the deadline.

Grading:

- Class participation will count towards 25% of the final grade.
- Class presentations will count towards 25% of the final grade.
- Written assignments will count towards 50% of the final grade, as follows:
 - o Critical reviews – 20% (10% each)
 - o Term paper – 40%