The Epistemology of Experimental Practices
Prof. Edouard Machery
Spring 2015

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Class Meetings
W 4:00-7:00 pm, conference room
(Exception: T, March 17)

Office Hours
By appointment.

Course Description/Goals
In this course we will look at epistemological issues raised by psychology, cognitive neuroscience, and neuropsychology. The possible topics of discussion include the role of dissociations in neuropsychology, the practice of reverse inference from brain data to psychological hypotheses in cognitive neuroscience, controversies about fMRI, and null hypothesis significance testing.

Texts
Readings will be available in a shared dropbox folder (you will receive a link to this folder by e-mail).

Assignments
(1) Readings and participation;
(2) One seminar presentation;
(3) A research paper due at the end of the term.

The seminar presentation includes *a presentation.* Your presentation should first identify the topics that are worth discussing in the papers you are looking at. You should then identify the relevant claims, arguments, and empirical findings. Importantly, *do not summarize* the readings: Everybody is supposed to have read the assigned readings. Your job is really to distinguish what is important and should be discussed from what is not. Second, you should have thought about these theses, arguments, and findings, and you should have developed criticisms and objections about these at some length. Students should meet with me during the week before their presentation. You should have developed a hand-out before meeting with me.

The research paper may be on any subject of relevance to the seminar. To assist you in commencing work, you should submit a brief essay proposal by **03/25**. It should contain a page-long description of the topic to be investigated and give a brief indication of the sources you intend to use. It may, but need not, be based on your seminar presentation. You are advised to talk to me about possible topics as soon as possible. The paper should have the form and length of a short journal article (no less than 4000 and ***no more than 7000 words***). The deadline is **04/22, 7:00 pm (send it by *e-mail*)**. **I do NOT issue**

incomplete grades, save in extraordinary circumstances. **Late papers will not be accepted.**

Assessment
Your grade will be based on the quality of your research paper due at the end of the term.

Class Organization
This course will be based on the discussion of the readings. Participation in class discussion is expected. Reading the articles is of course mandatory. *You are expected to attend every class*.

COURSE SCHEDULE
(Subject to revision as the semester proceeds)

Wednesday 01/14
Topic: Syllabus

NEUROPSYCHOLOGY

Wednesday 01/21
Topic: The Foundations of Neuropsychology
Readings:
Coltheart, M. (2001). Assumptions and methods in cognitive neuropsychology. In B. Rapp (ed.), *The Handbook of Cognitive Neuropsychology: What Deficits Reveal About the Human Mind* (pp. 3-21). Hove: Psychology Press.
Farah, M. J. (1994) Neuropsychological inference with an interactive brain: A critique of the 'locality' assumption. *Behavioral and Brain Sciences, 17*, 43-61.
Karmiloff-Smith, A., Scerif, G., and Ansari, D. (2003). Double dissociations in developmental disorders? Theoretically misconceived, empirically dubious. *Cortex*, 39, 161-163.
Machery, E. (2011). Developmental disorders and cognitive architecture. In A. De Block and P. Adriaens (Eds.), *Maladapting Minds: Philosophy, Psychiatry, and Evolutionary Theory*. Oxford: Oxford University Press.

Wednesday 01/28
Topic: What is a Dissociation and What is the Epistemology of Inferences from Dissociation?
Readings:
Shallice, T. (1988). *From Neuropsychology to Mental Structure*. Cambridge: Cambridge University Press. Chapters 10 & 11.
Davies, M. (2010). Double dissociation: Understanding its role in cognitive neuropsychology. *Mind & Language, 25*, 500-540.

Wednesday 02/04
Topic: Critiques of the Inference from Dissociations
Readings:

Glymour, C. (1994). On the methods of cognitive neuropsychology. *The British journal for the philosophy of science*, *45*, 815-835.
Plaut, D. C. (1995). Double dissociation without modularity: evidence from connectionist neuropsychology. *Journal of Clinical and Experimental Neuropsychology*, *17*, 291-321.
van Orden, G. C., Pennington, B. F., and Stone, G. O. (2001). What do double dissociations prove? Inductive methods and isolable systems. *Cognitive Science*, 25, 111-172.

COGNITIVE PSYCHOLOGY

Wednesday 02/11
Topic: What Statistics for the Behavioral Sciences?
Readings:
Dienes, Z. (2011). Bayesian versus orthodox statistics: Which side are you on? *Perspectives on Psychological Science*, *6*, 274-290.
Wetzels, R., Matzke, D., Lee, M. D., Rouder, J. N., Iverson, G. J., & Wagenmakers, E. J. (2011). Statistical evidence in experimental psychology an empirical comparison using 855 t tests. *Perspectives on Psychological Science*, *6*, 291-298.
Cumming, G. (2013). The new statistics why and how. *Psychological science*, *25*, 7-29.

Wednesday 02/18
Topic: Power and Negative Results
Readings:
Hoenig, J. M., & Heisey, D. M. (2001). The abuse of power: The pervasive fallacy of power calculations for data analysis. *Statistical Practice*, *55*, 1-6.
Machery, E. (2012). Power and negative results. *Philosophy of Science*, *79*, 808-820.
Button, K. S., Ioannidis, J. P., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S., & Ferguson, C. J., & Heene, M. (2012). A vast graveyard of undead theories publication bias and psychological science's aversion to the null. *Perspectives on Psychological Science*, *7*, 555-561.
Button, K. S., Ioannidis, J. P., Mokrysz, C., Nosek, B. A., Flint, J., Robinson, E. S., & Munafò, M. R. (2013). Power failure: why small sample size undermines the reliability of neuroscience. *Nature Reviews Neuroscience*, *14*, 365-376.
Dienes, Z. (2014). Using Bayes to get the most out of non-significant results. *Frontiers in psychology*, *5*.
Fraley, R. C., & Vazire, S. (2014). The N-pact factor: Evaluating the quality of empirical journals with respect to sample size and statistical power. *PloS one*, *9*, e109019.

Wednesday 02/25
Topic: Replication
Readings:
Cartwright, N. (1991). Replicability, reproducibility and robustness: Comments on Harry Collins. *History of Political Economy*, *23*, 143-155.
Pashler, H., & Harris, C. R. (2012). Is the replicability crisis overblown? Three arguments examined. *Perspectives on Psychological Science*, *7*, 531-536.

Ioannidis, J. P. (2012). Why science is not necessarily self-correcting. *Perspectives on Psychological Science, 7*, 645-654.
Cesario, J. (2014). Priming, replication, and the hardest science. *Perspectives on psychological science, 9*, 40-48.
Stroebe, W., & Strack, F. (2014). The alleged crisis and the illusion of exact replication. *Perspectives on Psychological Science, 9*, 59-71.

Wednesday 03/04
Topic: Metaanalysis
Readings:
Meehl, P. E. (1990). Why summaries of research on psychological theories are often uninterpretable. *Psychological Reports, 66*, 195-244.
Schmidt, F. L. (1992). What do data really mean? Research findings, meta-analysis, and cumulative knowledge in psychology. *American psychologist, 47*, 1173-1181.
Schmidt, F. L. (1996). Statistical significance testing and cumulative knowledge in psychology: Implications for training of researchers. *Psychological methods, 1*, 115-129.
Stegenga, J. (2011). Is meta-analysis the platinum standard of evidence? *Studies in history and philosophy of science part C: Studies in history and philosophy of biological and biomedical sciences, 42*, 497-507.
Stegenga, J. (2013). An impossibility theorem for amalgamating evidence. *Synthese, 190*, 2391-2115.

COGNITIVE NEUROSCIENCE & NEUROIMAGING

Tuesday 03/17 (to be confirmed)
Topic: Null Hypothesis Testing and fMRI
Readings:
Meehl, P. E. (1967). Theory-testing in psychology and physics: A methodological paradox. *Philosophy of Science 34*, 103-115.
Klein, C. (2010). Images are not the evidence in neuroimaging. *The British Journal for the Philosophy of Science, 61*, 265-278.
Machery, E. (2014). Significance testing in neuroimagery. In M. Sprevak and J. Kallestrup (Eds.), *New Waves in the Philosophy of Mind*. Palgrave.

Wednesday 03/25 NO CLASS
DEADLINE FOR ESSAY PROPOSAL

Wednesday 04/01
Topic: Reverse Inference
Readings:
Poldrack, R. A. (2006). Can cognitive processes be inferred from neuroimaging data? *Trends in Cognitive Sciences, 10*, 59–63.
Del Pinal, G., & Nathan, M. J. (2013). There and up again: On the uses and misuses of neuroimaging in psychology. *Cognitive neuropsychology, 30*, 233-252.
Hutzler, F. (2014). Reverse inference is not a fallacy per se: Cognitive processes can be inferred from functional imaging data. *NeuroImage, 84*, 1061-1069.

Machery, E. (2014). In defense of reverse inference. *The British Journal for the Philosophy of Science, 65,* 251-267.
Glymour, C. & Hanson, C. (Forthcoming). Reverse inference in neuropsychology. *The British Journal for the Philosophy of Science*.

Wednesday 04/08
Topic: Forward Inference
Readings:
Shallice, T. (2003). Functional imaging and neuropsychology findings: how can they be linked? *Neuroimage, 20,* S146-S154.
Henson, R. (2005). What can functional neuroimaging tell the experimental psychologist? *The Quarterly Journal of Experimental Psychology, 58,* 193-233.
Henson, R. (2006). Forward inference using functional neuroimaging: dissociations versus associations. *Trends in Cognitive Sciences, 10,* 64-69.
Machery, E. (2012). Dissociations in neuropsychology and cognitive neuroscience. *Philosophy of Science, 79,* 490-518.

Wednesday 04/15
Topic: Regions of Interest
Readings:
Saxe, R., et al. (2010). Divide and conquer: A defense of functional localizers. In S. J. Hanson & M. Bunzl (Eds.), *Foundational Issues in Human Brain Mapping*. Cambridge, MA: MIT Press. Chapter 1.
Friston, K., et al. (2010). A critique of functional localizers. In S. J. Hanson & M. Bunzl (Eds.), *Foundational Issues in Human Brain Mapping*. Cambridge, MA: MIT Press. Chapter 2.
Friston, K., & Henson, R. N. (2010). A commentary on divide and conquer. In S. J. Hanson & M. Bunzl (Eds.), *Foundational Issues in Human Brain Mapping*. Cambridge, MA: MIT Press. Chapter 3.

Wednesday 04/22
Topic: Cognitive Ontologies
Readings:
Price, C. J., and Friston, K. (2005). Functional ontologies for cognition: The systematic definition of structure and function. *Cognitive Neuropsychology*, 22, 262-275.
Poldrack, R. A., Halchenko, Y., and Hanson, S. J. (2009). Decoding the large-scale structure of brain function by classifying mental states across individuals. *Psychological Science*, 20, 1364-1372.
Lenartowicz, A., Kalar, D. J., Congdon, E., and Poldrack, R. A. (2010). Towards an ontology of cognitive control. *Topics in Cognitive Science*, 2, 678-692.
Klein, C. (2012). Cognitive Ontology and Region-versus Network-Oriented Analyses. *Philosophy of Science*, *79*(5), 952-960.
Lindquist, K. A., & Barrett, L. F. (2012). A functional architecture of the human brain: emerging insights from the science of emotion. *Trends in cognitive sciences*, *16*, 533-540.
Anderson, M.L. (2015). Mining the brain for a new taxonomy of the mind. *Philosophy Compass, 10,* 68-77.