CLPS 1480 Syllabus
Cognitive Control Functions of the Prefrontal Cortex
Spring, 2013 M 3:00-5:20pm

Instructor
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Course Description

Cognitive control functions of the prefrontal cortex

The prefrontal cortex has long been known to support higher cognitive functions, including working memory, planning, reasoning, and decision-making. This seminar offers an in-depth review of recent empirical and theoretical approaches to understanding prefrontal cortex function. This year the course will focus on prefrontal contributions to the cognitive control of declarative memory.

Course Policies

Grading

Reading Reactions: 20%

Final Paper: 25%

In-class presentations: 30%

Class Participation: 25%

Papers

You will be required to post two discussion questions about each paper to the Discussion section of the Canvas site each week. You have until noon Monday each week to post your questions. However, you cannot post something that has already been posted. You will be graded on the questions you post.

A final integrative paper (15 pages) due at the end of the term will either provide an integrative review of the literature on one of the topics in the course or propose a novel experiment (with proper motivation from the literature) that tests an open question related to the topics covered during the term.

Presentations

Each week a student will lead the discussion of one of the assigned papers. The

student should be prepared to not only summarize the paper, including what was done and what the conclusions were, but also to raise points of discussion to bring in other students in the class. Discussion leaders should also read students' reading reactions in preparation.

Class Participation

All students are required to read the papers each week, even if they are not presenting, and contribute actively to the class discussion. The reaction papers will be a good chance to write down some potential topics for discussion to raise with the group. Your preparation, participation, and cooperation as a group is essential for this format to work. Note that participation involves both your willingness to generate comments/questions *and* your ability to listen to what others have to say.

Class Schedule

Topic: Introduction and Background

1/28/2013 - Organizational class

2/4/2013 (Prof. Badre)

Benjamin, A. S. (2007). Memory is more than just remembering: Strategic control of encoding, accessing memory, and making decisions. In (A. S. Benjamin & B. H. Ross, Eds), *Psychology of Learning and Motivation (vol. 28): Skill an Strategy in Memory Use*. Elsevier: New York. (pp. 175-223).

Moscovitch, M. (1992). Memory and working-with-memory: A component process model based on modules and central systems. *Journal of Cognitive Neuroscience, 4(3),* 257-267.

Miller, E. K. and Cohen, J. D. (2001). An Integrative theory of prefrontal cortex. *Annual Review of Neuroscience, 24,* 167-202

OPTIONAL

Atkinson, R. C., and Shiffrin, R. M. (1971). The control of short-term memory. *Scientific American, 224,* 82-90.

Devinsky, O. and D'Esposito, M. (2004). Executive function and the frontal lobes. In *Neurology of Cognitive and Behavioral Disorders*. Oxford University Press: New York (pp. 302-329).

Topic: Elaborative Encoding

2/11/2013

Staresina, B. P., Gray, J. C., and Davachi, L. (2009). Event congruency enhances episodic memory encoding through semantic elaboration and relational binding. *Cerebral Cortex, 19(5),* 1198-1207.

Innocenti, I., Giovannelli, F., Cincotta, M., Feurra, M., Polizzotto, N. R., Bianco, G., Cappa, S.F., and Rossi, S. (2010). Event-related rTMS at encoding affects differently deep and shallow memory traces. *Neuroimage, 53(1)*, 325-30.

Topic: Organizational Encoding Strategies

2/25/2013

Gershberg, F. B., and Shimamura, A. P. (1995). Impaired use of organizational

strategies in free recall following frontal lobe damage. *Neuropsychologia, 33(10),* 1305-1333.

Blumenfeld, R. S., and Ranganath, C. (2006). Dorsolateral prefrontal cortex promotes long-term memory formation through its role in working memory organization. *Journal of Neuroscience, 26(3),* 916-925.

Optional

Raz, A., Packard, M.G., Alexander, G.M., Buhle, J.T., Zhu, H., Yu, S., Peterson, B.S. (2009). A slice of pi: an exploratory neuroimaging study of digit encoding and retrieval in a superior memorist. *Neurocase, 15(5),* 361-72.

Kondo, Y., Suzuki, M., Mugikura, S., Abe, N., Takahashi, S., Iijima, T., and Fujii, T. (2005). Changes in brain activation associated with use of a memory strategy: a functional MRI study.

Topic: Recollection versus Familiarity

3/4/2013

Herzmann, G., Jin, M., Cordes, D., and Curran, T. (2013). A within-subject ERP and fMRI investigation of orientation-specific recognition memory for pictures. *Cognitive Neuroscience, 3(3-4),* 174-192.

Aly, M., Yonelinas, A. P., Kishiyama, M. M., and Knight, R. T. (2011). Damage to the lateral prefrontal cortex impairs familiarity but not recollection. *Behavioural Brain Research, 225,* 297-304.

Background

Spaniol, J., Davidson, P. S., Kim, A.S., Han, H., Moscovitch, M., and Grady, C.L. (2009). Event-related fMRI studies of episodic encoding and retrieval: meta-analyses using activation likelihood estimation. *Neuropsychologia, 47(8-9),* 1765-79.

Topic: Controlled Retrieval versus Post-Retrieval Selection

3/11/2013

Race, E. A. Shanker, S., and Wagner, A. D. (2009). Neural priming in human frontal cortex: Multiple forms of learning reduce demands on the prefrontal executive system. *Journal of Cognitive Neuroscience, 21(9),* 1766–1781.

Barredo, J., Öztekin, I., and Badre, D. (revision submitted). Ventral fronto-temporal pathway supporting cognitive control of episodic memory retrieval. *J. Neuro.*

Background

Badre, D. & Wagner, A. D. (2007). Left ventrolateral prefrontal cortex and the cognitive control of memory. *Neuropsychologia, 45,* 2883-2901

Optional

Snyder, H. R., Banich, M. T., & Munakata, Y. (2011). Choosing our words: Retrieval and selection processes recruit shared neural substrates in left ventrolateral prefrontal cortex. *Journal of Cognitive Neuroscience*, 23, 3470-3482.

Topic: Source Retrieval

3/18/2013

Addante, R. J., Watrous, A. J., Yonelinas, A. P., Ekstrom, A. D., and Ranganath, C. (2011). Prestimulus theta activity predicts correct source memory retrieval. *PNAS, 108(26),* 10702-10707.

Raposo, A., Han, S., and Dobbins, I. G. (2009). Ventrolateral prefrontal cortex and self-initiated semantic elaboration during memory retrieval. *Neuropsychologia, 47(11),* 2261-71.

Background

Rugg, M. & Wilding, E. L. (2000). Retrieval processing and episodic memory. *Trends in Cognitive Science, 4(3),* 108-115.

Topic: Post-retrieval Monitoring

4/1/2013

Gilboa, A., Alain, C., Stuss, D. T., Melo, B., Miller, S., Moscovitch, M. (2006). Mechanisms of spontaneous confabulations: a strategic retrieval account. *Brain, 129(6),* 1399-414.

Hayama, H. R., and Rugg, M. D. (2009). Right dorsolateral prefrontal cortex is engaged during post-retrieval processing of both episodic and semantic information. *Neuropsychologia, 47(12),* 2409-16.

Background

Schacter, D. L., and Slotnick, S. D. (2004). The cognitive neuroscience of memory distortion. *Neuron, 44(1),* 149-160.

OR

Moscovitch, M., & Melo, B. (1997). Strategic retrieval and the frontal lobes: Evidence from confabulation and amnesia. *Neuropsychologia, 35,* 1017–1034.

Topic: Recall and Temporal Order

4/8/2013

Manning, J. R., Sperling, M. R., Sharan, A., Rosenberg, E. A., and Kahana, M. J. (2012). Spontaneously reactivated patterns in frontal and temporal lobe predict semantic clustering during memory search. *Journal of Neuroscience, 32(26),* 8871-8878.

Becker, S., and Lim, J. (2003). A computational model of prefrontal control in free recall: Strategic memory use in the California Verbal Learning Task. *Journal of Cognitive Neuroscience, 15(6),* 821-832.

Background

Stuss, D. T., Alexander, M. P., Palumbo, C. L., Buckle, L., Sayer, L., & Pogue, J. (1994). Organizational strategies of patients with unilateral or bilateral frontal lobe injury in word list learning tasks. *Neuropsychology, 8,* 355–373.

Topic: Interference Resolution and Forgetting

4/15/2013

Öztekin, I., and Badre, D. (2011). Distributed patterns of brain activity that lead to forgetting. *Frontiers in Human Neuroscience, 5,* 1-8.

Kuhl, B. A., Dudukovic, N. M., Kahn, I. and Wagner, A. D. (2007). Decreased demands on cognitive control reveal the neural processing benefits of forgetting. *Nature Neuroscience, 10,* 908-914.

Topic: Memory Suppression

4/22/2013

Benoit, R. G., Anderson, M. C. (2012).Opposing mechanisms support the voluntary forgetting of unwanted memories. *Neuron, 76(2),* 450-460.

Levy, B. J., and Anderson, M. C. (2012). Purging of memories from conscious awareness tracked in the human brain. *Journal of Neuroscience, 32(47),* 16785-16794.

Background

Anderson, M. C., Ochsner, K. N., Kuhl, B., Cooper, J., Robertson, E., Gabrieli, S. W., Glover, G.H., Gabrieli, J.D. (2004). Neural systems underlying the suppression of unwanted memories. *Science, 303,* 232-235.

Topic: Reward systems at Encoding

4/29/2013

Wittmann, B.C., Schott, B.H., Guderian, S., Frey, J.U., Heinze, H.J., and Düzel,

E. (2005). Reward-related FMRI activation of dopaminergic midbrain is associated with enhanced hippocampus-dependent long-term memory formation.
Neuron, 45, 459–467.

Adcock, R.A., Thangavel, A., Whitfield-Gabrieli, S., Knutson, B., and Gabrieli, J.D.E. (2006). Reward-motivated learning: mesolimbic activation precedes memory formation. *Neuron, 50,* 507–517.

Background

Shohamy, D., and Adcock, R.A. (2010). Dopamine and adaptive memory.
Trends in Cognitive Science, 14, 464–472.

OR

Lisman, J.E., and Grace, A.A. (2005). The hippocampal-VTA loop: controlling the entry of information into long-term memory. *Neuron, 46*, 703–713.

Topic: Basal Ganglia Systems and Retrieval

5/6/2013

Han, S., Huettel, S.A., Raposo, A., Adcock, R.A., and Dobbins, I.G. (2010). Functional significance of striatal responses during episodic decisions: recovery or goal attainment? *Journal of Neuroscience, 30,* 4767–4775.

Cohn, M., Moscovitch, M., and Davidson, P.S.R. (2010). Double dissociation between familiarity and recollection in Parkinson's disease as a function of encoding tasks. *Neuropsychologia, 48*, 4142–4147.

Background

Scimeca, J. M. and Badre, D. (2012). Striatal contributions to declarative memory retrieval. *Neuron, 73,* 380-392.

5/13/2013 – FINAL PAPER DUE BY E-MAIL