

## **Seminar on Cognitive Electrophysiology (P657)**

Instructor: Brian F. O'Donnell, Ph.D.  
Indiana University  
Fall Semester 1999  
MW 11:15 to 1:10 PM, PY 130  
Office: Rm 150, Psychology Building  
Office hours: 1 to 2:30 PM Thursday  
9 AM to 10 AM, Friday  
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### **Syllabus**

Course objectives. This seminar will focus on the application of event-related potential (ERP) technology to questions in psychology and neuroscience. Four areas will be reviewed: 1) Neural substrates of event related potentials and techniques for source localization, 2) Experimental methodology, 3) Event-related potentials studies of sensory and cognitive processes, and 4) Event-related potential paradigms in psychopathology and neuropsychology. ERP findings will be reviewed for aging, neurodegenerative disorders, schizophrenia, depression, bipolar disorder, stroke, attention deficit disorder, and autism. There will also be laboratory demonstrations so that students who are not doing a project can get hands-on experience using the technology. Grades will be based on participation, presentations on topics, and one review or research paper.

Course format. The class will focus on a specific discussion topic each week, which will be associated with a set of assigned readings. All required readings must be completed prior to each class, since the discussions will be a major component of what is learned in the seminar. In addition to open discussion, each student will do a brief (5 to 10 minute) summary and critique of one of the readings assigned for that week.

Course requirements and grading. Grades will be based on participation in the seminar (20%), presentations on topics (50%), and one paper (30%). The paper can be a scholarly review of a topic, or a paper based on a pilot study carried out during the semester (15 to 25 pages, double spaced, excluding references). The review paper should review the literature relevant to one current topic or issue in cognitive electrophysiology, and provide a summary and critique of the major viewpoints in the field. The student should discuss the topic of the paper with me prior to October 5th, and have an abstract with a minimum of ten readings completed by November 5<sup>th</sup>. The student will do a 20 minute presentation of the paper topic during the weeks of November 29th and December 6<sup>th</sup>. Papers are due on the day of your presentation. The lab paper will be focused on the issues addressed in the study, with a Results and Discussion section on Preliminary data and methodological issues that arose in devising and running the experiment.

Text: Rugg MD & Coles MG (Eds.). Electrophysiology of Mind: Event-Related Potentials and Cognition. New York, Oxford, 1995.

Change. In the event changes are required in the course schedule or requirements, you will be notified by an announcement in class.

## Weekly Topics and Readings

### **August 30: ERPs as measures of neural and cognitive processes**

Coles GH and Rugg MD. Event-Related Brain Potentials: an Introduction (In Rugg and Coles)

Rugg MD and Coles GH. The ERP and Cognitive Psychology: Conceptual Issues (In Rugg and Coles)

Regan, D. Human Brain Electrophysiology: Evoked Potentials and Evoked Magnetic Fields in Science and Medicine. Elsevier: NY, 1989, pp. 1-50.

### **Sept 6: Time, Amplitude, and Topography I**

Coles MGH, Henderikus GOM Smid, Scheffers MK, Otten LJ. Mental chronometry and the study of human information processing (In Rugg and Coles).

Sutton S., Tueting P, Zubin J, John ER. (1965). Information delivery and the sensory evoked potential. Science, 155, 1436-1439.

Kutas M., McCarthy, G., and Donchin, E. (1977). Augmenting mental chronometry: the P300 as a measure of stimulus evaluation time. Science, 197, 795-5.

Squires KC, Wickens C, Squires NC, Donchin E. (1976). The effect of stimulus sequence on the waveform of the cortical event-related potential. Science, 193, 1142-1146.

Goodin DS, Aminoff MJ, Mantle MM. (1986). Subclasses of event-related potentials: response-locked and stimulus locked components. Annals of Neurology, 20, 603-609.

### **Sept 13: Time, Amplitude, and Topography II**

Simson R, Vaughan HG, Ritter W (1976): The scalp topography of potentials associated with missing visual or auditory stimuli. Electroencephalogr Clin Neurophysiol 40:33-42.

Simson R, Vaughan HG, Ritter W (1977): The scalp topography of potentials in auditory and visual discrimination tasks. Electroencephalogr Clin Neurophysiol 42:528-535.

McCarthy G, Wood CC (1985): Scalp distributions of event-related potentials: an ambiguity associated with analysis of variance models. Electroencephalogr Clin Neurophysiol 63:203-208.

Naatanen R, Paavilainen P, Tiitinen H, Jiang D, Alho K. (1993). Attention and mismatch negativity. Psychophysiology, 30, 436-450.

### **Sept 20: Neural Circuits and the event-related potential.**

Regan, D. Human Brain Electrophysiology: Evoked Potentials and Evoked Magnetic Fields in Science and Medicine. Elsevier: NY, 1989, pp. 167-209.

Halgren EJ, Squires NK, Wilson CL et al (1980): Endogenous potentials generated in the human hippocampal formation and amygdala by infrequent events. Science 210:803-805.

Allison T, Ginter H, McCarthy G, Nobre AC, Puce A, Luby M, Spencer DD. Face recognition in the

human extrastriate cortex. Journal of Neurophysiology.

Nunez P. Physical principles and neurophysiological mechanisms underlying event-related potentials. (1990). In Rohrbaugh JW, Parasuraman R, Johnson R (Eds.), Event-Related Potentials: Basic Issues and Applications. New York: Oxford, pp. 19-36.

Pineda JA, foote SL, Neville HJ. (1989). Effects of locus coeruleus lesions of auditory, long latency, event-related potentials in monkey. Journal of Neuroscience, 9, 81-93.

Schroeder CE, Tenke CE, Givre SJ, Arezzo JC, Vaughan HG. (1991). Striate cortical contribution to the surface-recorded patten-reversal VEP in the alert monkey. Vision Research, 31, 1143-1157.

### **Sept 27: Gamma range activity and information processing**

Bressler S. The gamma wave: a cortical information carrier? Trends Neurosci. 1990;13:161-16

Bressler SL, Coppola R, Nakamura R. (1993). Episodic multiregional cortical coherence at multiple frequencies during visual task performance. Nature, 366, 153-156.

Tiitinen H, Sinkkonen J, Reinikainen K, Alho K, Lavikainen J, Näätänen R. Selective attention enhances the auditory 40-Hz transient response in humans. Nature. 1993;364:59-60.

Kwon J.S., O'Donnell, B.F., Wallenstein, G.V. Greene, R.W., Hirayasu, Y., Nestor, P.G., Hasselmo, M.E., Potts, G.F., Shenton, M.E., McCarley, R. W. Gamma Frequency Range Abnormalities to Auditory Stimulation in Schizophrenia. Archives of General Psychiatry, in press.

Lins OG, Picton TW. Auditory steady-state responses to multiple simultaneous stimulation Electroencephal Clin Neurophysiol. 1995;96:420-432.

Srinivasan R., Russell D.P., Edelman G.M., Tononi, G. (1999). Increased synchronization of neuromagnetic responses during conscious perception. Journal of Neuroscience, 19, 5435-5448.

### **Oct 4: Attention I**

Gehring WJ, Goss B, Coles MGH, Meyer DE, Donchin E. (1993). A neural system for error detection and compensation. Psychological Science, 4, 385-390.

Luck SJ, vogel EK, Shapiro KL. (1996). Word meanings can be accessed but not reported during the attentional blink. Nature, 383, 616-618.

Mangun GR & Hillyard SA. Mechanisms and models of selective attention. (In Rugg and Coles).

Motter B.C. (1998). Neurophysiology of visual attention. In Parasuraman, R. (Ed.), The Attentive Brain. Boston, MIT Press, pp. 51-70.

### **Oct 11: Attention II**

Donchin E. & Coles, M.G.H. (1998). Is the P300 component a manifestation of context updating? Behavioral and Brain Sciences 11, 357-374.

Open Peer Commentary & Author's Response (1998). Behavioral and Brain Sciences 11, 374-408.

Luck SJ. (1998). Sources of dual-task interference: evidence from human electrophysiology. Psychological Science, 9, 223-227.

Picton TW. (1992). The P300 wave of the human event-related potential. Journal of Clinical Neurophysiology, 9, 456-479.

### **Oct 18: Language**

Bentin S, Mouchetant-Rostaing Y, Giard MH, Echallier JF, Pernier J. (1999). ERP manifestations of processing printed words at different psycholinguistic levels: Time course and Scalp Distribution. Journal of Cognitive Neuroscience, 11, 235-260.

Kutas M, Hillyard SA. Reading senseless sentences: brain potentials reflect semantic incongruity. Science, 207, 203-205.

Nigam A, Hoffman JE, Simons RF. N400 to semantically anomalous pictures and words. (1992). Journal of Cognitive Neuroscience, 4, 15-22.

Osterhout L & Holcomb P.J. Event-related potentials and language comprehension. (In Rugg and Coles).

### **Oct 25: Memory**

Rugg M.D. ERP studies of memory. (In Rugg and Coles).

Bentin S. (1995). Semantic processing and memory for attended and unattended words in dichotic listening: Behavioral and electrophysiological evidence. Journal of Experimental Psychology, 23, 54-67.

Meador KJ, Loring DW, Davis HC, Sethi KD, Patel BR, Adams, RJ, Hammond EJ. (1989). Cholinergic and Serotonergic effects on the P3 potential and recent memory, Journal of Clinical and Experimental Neuropsychology, 11, 252-260.

Nobre AC, Allison T, McCarthy, G. (1994). Word recognition in the human inferior temporal lobe. Nature, 372, 260-262.

### **Nov 1: Development and developmental disorders**

**TBA**

### **Nov 8: Aging and Neurologic Disorders**

Hansch EC, Syndulko K, Cohen SN, Goldberg ZI, Potvin AR, Tourtellotte WW. (1982). Cognition in Parkinson disease: an event-related potential perspective. Annals of Neurology. 1982, 11, 599-607.

Knight, R.T. (1996). Contribution of human hippocampal region to novelty detection. Nature, 383, 256-259.

Pfefferbaum A, Wenegrat BG, Ford JM, Roth WT, Kopell BS. Clinical application of the P3 component of event-related potentials. II. Dementia, depression and schizophrenia. Electroencephalogr Clin Neurophysiol. 1984;59(2):104-24.

Polich J. (1996). Meta-analysis of P300 normative aging studies. Psychophysiology, 33, 334-353.

Polich J, Pollock VE, Bloom FE. (1994). Meta-analysis of P300 amplitude from males at risk for alcoholism. Psychological Bulletin, 115, 55-73.

Tachibana H, Aragane K, Kawabata K, Sugita M. (1997). P3 latency change in aging and Parkinson disease. Arch Neurol. 54, 296-302.

### **Nov 15: Psychopathology**

Bruder GE, Tenke CE, Stewart JW, Towey JP, Leite P, Voglmaier M, Quitkin FM. (1995). Brain event-related potentials to complex tones in depressed patients: relations to perceptual asymmetry and clinical features. Psychophysiology, 32, 373-381.

Bruder et al. (1998). Time course of visuospatial processing deficits in schizophrenia: an event-related potential study. Journal of Abnormal Psychology, 3, 399-411.

Ford, J. M., White, P. M., Csernansky, J. G., Faustman, W. O., Roth, W. T. & Pfefferbaum, A. (1994). ERPs in schizophrenia: effects of anti-psychotic medication. Biological Psychiatry, 36, 153-170.

Niznikiewicz, M.A., O'Donnell, B.F., Nestor, P.G., Smith, L., Law, S., Karapellou, M., Shenton, M.E., McCarley, R.W. (1997). ERP assessment of visual and auditory language processing in schizophrenia. Journal of Abnormal Psychology, 106, 85-94.

### **Nov 22: Individual differences**

Hansenne M. (1999). P300 and personality: an investigation with the Cloninger's model. Biological Psychology, 30, 142-155.

O'Donnell, B.F., Friedman, S., Maloon, A. and Drachman, D.A. (1992). P3 latency and neuropsychological performance: Influence of age and individual differences. International Journal of Psychophysiology, 12, 187-195.

Polich J, Kok A. (1995). Cognitive and biological determinants of P300: an integrative review. Biological Psychology, 41, 103-146.

### **Nov 24 - 28: Happy Thanksgiving!**

### **Nov 29: Presentations**

Picton TW, Stuss, DT. (1994). Neurobiology of conscious experience. Current Opinion in Neurobiology, 4, 256-265.

### **Dec 6 Presentations**

### **Dec 13 Final Exam Week**