Psychophysiology Course, Spring, 1994, Richard J. Davidson, Ph.D.

C&T = Cacioppo, J.T. & Tassinary, L.G. (Eds.). (1990). *Principles of psychophysiology: Physical, social, and inferential elements*. Cambridge, UK: Cambridge University Press.

Schedule of Lectures, Labs and Reading Assignments

In the schedule below, the topic and reading assignments for the lab for each week are listed below the same information for the lectures.

January 26: Introduction to Psychophysiology

Chapter 1 in C & T.

Lab: No lab sections this week

February 2: Introduction Continued, and Basic Electricity

Duffy, F.H., Iyer, V.G. and Surwillo, W.W. (1989). Clinical Electroencephalography and Topographic Brain Mapping. New York: Springer-Verlag, pp. 11-41.

Recommended:

Gibson, Basic Electricity, Chapter 1 or
Harvard Project Physics, 14.1-14.6

Lab: Basic Electricity

Review electricity readings

Recommended:

Koester, J. (1985). Review of electrical circuits. In E.R. Kandel and J.H. Schwartz, Principles of Neural Science, 2nd Edition (pp. 879-886). New York: Elsevier.

February 9: Special Guest Lecture

February 16: Introduction to the Autonomic Nervous System and Electrodermal Activity

McCurdy, H.G. (1950). Consciousness and the galvanometer. Psychological Review, 57, 322-327.

Bernston, G.G., Cacioppo, J.T. & Quigley, K.S. (1991). Autonomic determinism: Modes of autonomic control, the doctrine of autonomic space and the laws of autonomic constraint. Psychological Review, 98, 459-487.

Recommended:

Fowles, D.C. (1986). The eccrine system and electrodermal activity. In M.G.H. Coles, E. Donchin & S.W. Porges (Eds.), Psychophysiology: Systems, processes and applications (pp. 51-96). New York: Guilford.

Lab: Electrical Safety/Introduction to the Polygraph as a Measurement System

Duffy, F.H. et al. (1989), pp. 54-59.

Recommended:

Chapter 4 in C & T

February 23: Electrodermal Activity II: Recovery, orienting and defensive responses

Chapter 10 in C & T

Ohman, A. (1979). The orienting response, attention and learning: An information processing perspective. In H.D. Kimmel, E.H. an Olst and F. Orlebeke (Eds.), The Orienting Reflex in Humans (pp. 443-471). Hillsdale, N.J.: Erlbaum.

Graham, F.K. (1979). Distinquishing among orienting, defense and startle reflexes. In H.D. Kimmel et al. (pp. 137- 167).

Recommended:

Ohman, A. (1986). Face the beast and fear the face: Animal and social fears as prototypes for evolutionary analyses of emotion. Psychophysiology, 23, 123-145.

Lab: Recording Electrodermal Activity/Experiment 1: The Guilty Knowledge Test

Fowles, D.C., Christie, M.J., Edelberg, R., Grings, W.W., Lykken, D.T. and Venables, P.H. (1981). Publication recommendations for electrodermal measurements. Psychophysiology, 18, 232-239.

Lykken, D.T. (1959). The validity of the guilty knowledge technique: The effects of faking. Journal of Applied Psychology, 44, 258-262.

Lab Handout

March 2: Introduction to Cardiovascular Psychophysiology

Chapter 14 in C & T

Lab: Recording and Quantifying EKG

Tursky, B. and Jamner, L.D. (1982). Measurement of cardiovascular functioning. In J.T. Cacioppo and R.E. Petty (Eds.), Perspectives in Cardiovascular Psychophysiology (pp. 19-44). New York: Guilford.

March 9: Cardiovascular Psychophysiology II

Lacey, J.I. (1967). Somatic response patterning and stress: Some revisions of activation theory. In M. Appley and R. Trumbell (Eds.), Psychological Stress (pp.14-37). New York: Appleton-Century Crofts.

Obrist, P.A. et al. (1970). The cardiosomatic relationship: Some reformulations. Psychophysiology, 6, 569-587.

Obrist, P.A. (1976). The cardiovascular-behavioral interaction as it appears today. Psychophysiology, 13, 95-

Lacey, B.C. and Lacey, J.I. (1978). Two-way communication between the heart and the brain: Significance of time within the cardiac cycle. American Psychologist, 33, 99-113.

Lab: Experiment II: Autonomic Concomitants of Mental Effort

Tursky, B., Schwartz, G.E., and Crider, A. (1970) Differential patterns of heart rate and skin resistance during a digit-transformation task. Journal of Experimental Psychology, 83, 451-457.

Lab handout

March 16: Cardiovascular Psychophysiology III: Individual Differences, Emotion and Related Phenomena

Fowles, D.C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity and psychopathy. Psychophysiology, 17, 87-104.

Levenson, R.W., Ekman, P.E. & Friesen, W.V. (1990). Voluntary facial action generates emotion-specific autonomic nervous system activity. Psychophysiology, 27, 363-384.

Kagan, J., Reznick, J.S. and Snidman, N. (1988). Biological bases of childhood shyness. Science, 240, 167-171.

Lab: EKG Analysis Software

Coles, M.G.H., Gratton, G., Kramer, A.F. and Miller, G.A. (1986). Principles of signal acquisition and analysis. In Coles et al. (pp. 183-221).

March 23: Electrical Activity of the Skeletal Musculature

Chapter 11 in C & T

Fridlund, A.J. and Cacioppo, J.T. (1986). Guidelines for human electromyographic research. Psychophysiology, 23, 567-589.

Lang, P., Bradley, M.M. & Cuthbert, B.N. (1990). Emotion, attention and the startle reflex. Psychological Review, 97, 377-398.

Lab: Startle Probe Measures of Attention and Emotion

Vrana, S.R, Spence, E.L. & Lang, P.J. (1988). The startle probe: A new measure of emotion? Journal of Abnormal Pschology, 97, 487-491.

March 30: No Class: Spring Break

April 6: Introduction to the Central Nervous System and Cerebral Psychophysiology

Nauta, W.J.H. and Feirtag, M. (1979). The organization of the brain. Scientific American, 241, 88-111.

Kolb, B. and Whishaw, I.Q. (1985). Fundamentals of Human Neuropsychology, 2nd Edition (pp. 3-61). New York: W.H. Freeman.

Lab: Recording Brain Electrical Activity

Pivik, T., Broughton, R., Coppola, R., Davidson, R.J., Fox, N.A. & Nuwer, R. (1993). Guidelines for quantitative electroencelphalography in research contexts. Psychophysiology, 30, 547-558.

April 13: What is EEG Good for and Where Does it Come From?

Thatcher, R.W. and John, E.R. (1977). Functional Neuroscience, Volume I: Foundations of Cognitive Processes (pp. 1-82). Hillsdale, N.J.: Erlbaum.

Lab: Experiment III: EEG Asymmetry

Davidson, R.J. (1988). EEG measures of cerebral asymmetry: Conceptual and methodological issues. International Journal of Neuroscience, 39, 71-89.

Davidson, R.J., Chapman, J.P., Chapman, L.J. & Henriques, J.B. (1990). Asymmetrical brain electrical activity discriminates between psychometrically-matched verbal and spatial cognitive tasks. Psychophysiology, 27, 528-543.

Lab Handout

April 20: EEG Asymmetry: Cognitive and Affective Lateralization

Galin, D. and Ornstein, R. (1972). Lateral specialization of cognitive mode: An EEG study. Psychophysiology, 9, 412-418.

Davidson, R.J. & Tomarken, A.J. (1989). Laterality and emotion: An electrophysiological approach. In F. Boller and J. Grafman (Eds.), Handbook of Neuropsychology. Amsterdam: Elsevier.

John, E.R. (1989). The role of quantitative EEG topographic mapping or "neurometrics" in the diagnosis of psychiatric and neurological disorders: The pros. Electroencephalography and Clinical Neurophysiology, 73, 2-4.

Fisch, B.J. & Pedley, T.A. (1989). The role of quantitative EEG topographic mapping or "neurometrics" in the diagnosis of psychiatric and neurological disorders: The cons. Electroencephalography and Clinical Neurophysiology, 73, 5-9.

Lab: Experiment III Continued

No reading

April 27: Introduction to Event-Related Potentials

Chapter 13 in C & T

Donchin, E. (1979). Event-related brain potentials: A tool in the study of human information processing. In H. Begleiter (Ed.), Evoked Brain Potentials and Behavior (pp. 13-88). New York: Plenum Press.

Lab: Signal Averaging and ERP demonstration

Re-read relevant sections of Coles et al. "Principles" chapter

May 4: ERPs II

Saron, C.D. & Davidson, R.J. (1989). Visual evoked potential measures of interhemispheric transfer time in humans. Behavioral Neuroscience, 103, 1115-1138.

Gevins, A.S. et al. (1989). Event-related covariances during a bimanual visuomotor task. I. Methods and analysis of stimulus and response-locked data. Electroencephalography and Clinical Neurophysiology, 74, 58-75.

Gevins, A.S., Le, J., Brickett, P., Reutter, B., & Desmond, J. (1991). Seeing through the skull: Advanced EEGs use MRIs to accurately measure cortical activity. Brain Topography, 4, 125-132.

Beatty, J., Barth, D.S., Richer, F., and Johnson, R.A. (1986). Neuromagnetometry. In M.G.H. Coles et al. (pp. 26-40).

Lab: ERP Demonstration in Davidson's Lab

Handout

May 11: The future of psychophysiology: Positron emission tomography (PET) and functional magnetic resonance imaging (fMRI)

Raichle, M.E. (1987). Circulatory and metabolic correlates of brain function in normal humans. In V.B. Mountcastle (Ed.), Handbook of Physiology, Vol. V: Higher functions of the brain, Part 2 (pp. 643-674). Bethesda, MD: American Physiological Society.

McCarthy, G., Blamire, A.M., Rothman, D.L., Gruetter, R., & Shulman, R.G. (1993). Echo-planar magnetic resonance imaging studies of frontal cortex activation during word generation in humans. Proceedings of the National Academy of Sciences, 90, 4952-4956.