Psychophysiology Methods and Analysis Laboratory
PSYC G6050y
4 points

Syllabus Updated 12-29-15

Course
Seminar Location: Schermerhorn 200B
Lab Location: Schermerhorn 200A
Term: Spring 2016
Days: Mondays and Wednesdays
Time: 10:10 am – 12:00 pm

Instructor
Dr. Niall Bolger
Office: Schermerhorn 402A
Office Hours: TBD
Email: bolger@psych.columbia.edu
Website:

Graduate Teaching Assistant
Abdiel J. Flores
Office: Schermerhorn 219
Office Hours: TBD
Email: abdielflores@psych.columbia.edu

Graduate Teaching Assistant
Katherine S. Zee
Office: Schermerhorn 329
Office Hours: TBD
Email: kzee@psych.coumbia.edu

Pre-Requisites

This course is open to graduate students only. Instructor's permission is required for registration. Enrollment limit is 16.

Course Description

Provides an introduction to the theory, methods, and analytic approaches behind psychophysiological methods such as skin conductance and impedance cardiography. The course will include both in-class discussions and hands-on laboratory experience collecting psychophysiological data, augmented with current and classic readings on the course topics. This course is aimed at graduate students in psychology or a related field.

Course Overview

The goal of this course is to provide students with an introduction to psychophysiological theory, methods, and analytic approaches. This course will cover 6 methodologies or modules applied to range of research topics in psychology: 1) skin conductance; 2) heart rate variability; 3) impedance cardiography; 4) salivary hormones; 5) blood pressure; and 6) facial electromyography. The course will meet twice a week, with a mix of seminar-style class meetings and lab sessions. Seminar classes will be used to discuss theories and application of each method focused on critically evaluating the current and former literature using the psychophysiological method of discussion. Lab classes will be used to observe demonstration of correct sensor application for each method and opportunities for students to get hands-on experience collecting psychophysiological data. Labs will also be used to learn how to visually inspect and remove noise and artifact from physiological data. Lastly, students will learn how to analyze psychophysiological data using R.

For Psychology PhD students, this course will count toward the statistics course requirement.

Grading and Requirements

10% – Participation
20% – Labs
30% – Research Proposal - Presentation

40% – Research Proposal – Written (due last day of class: Monday, May 2)

Lab Assignments and Homework

Each week students will have the opportunity to learn how to correctly apply, collect, clean, and quantify psychophysiological data. Lab time will be used to practice these skills. Lab assignments are designed to ensure that students are correctly cleaning and analyzing physiological data. There will be a total of 6 labs due throughout the semester reflecting the 6 methods covered in the course. Lab assignments will consist of attending trainings and demonstrations during class time and then applying the new material on the student's own time; timing for each assignment may vary due to the progress made during class, but in general labs will require approximately 30-60 of independent work outside of class meetings.

There will also be assigned readings to accompany the start of each module. Readings will be available on Courseworks as PDFs for students to download. In addition to the required readings, we have also provided a supplementary reading list for those interested in delving deeper into a particular topic.

Research Proposal

The course will culminate in the development of an individual research proposal. The research proposal can be about any topic within psychology but must incorporate at least one psychophysiological method covered in this course (students who wish to emphasize a psychophysiological method not covered in this course must consult with course instructor(s)). The proposal should outline the research question, provide a justification for why the chosen psychophysiological method would be appropriate, and outline their expected results. Note that the strongest proposals will integrate psychophysiological methods with psychological theory and will coordinate physiological outcomes with other types of outcomes (e.g., self-report, behavioral, cognitive, etc.).

Students will be asked to present their proposal in two ways. The first will consist of a 10-minute presentation during the last class periods. The second will consist of a written proposal, approximately 10 pages in length (double spaced). We encourage students to view the research proposal aspect of the course as an opportunity to begin developing ideas for grant applications (NSF, NRSA, etc.).

Academic Integrity

"The intellectual venture in which we are all engaged requires of faculty and students alike the highest level of personal and academic integrity. As members of an academic community, each one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity...In practical terms, this means that, as students, you must be responsible for the full citations of others' ideas in all of your research papers and projects; you must be scrupulously honest when taking your examinations; you must always submit your own work and not that of another student, scholar, or internet agent." From the Faculty Statement on Academic Integrity (www.college.columbia.edu/academics/integrity-statement)

Date	Topic	Agenda	Notes
Module 1: Introduction to Psychophysiological Science and Analysis			
W 1/20	Introduction	Intro to psychophysiological inference Intro to 4 categories of psychophysiological relationships	
M 1/25	Introduction	Principles of Electrical Signals Introduction to Psychophysiology Equipment	KZ away/Skypes in
W 1/27	*No Class*		NB, AF, & KZ at SPSP Conference
M 2/1	Introduction	Repeated Measures Analysis Boot Camp	

Reading List:
* = Assigned reading; all other readings supplemental

Blascovich, J., Mendes, W. B., Vanman, E. & Dickerson, (2011). Social Psychophysiology for Social and Personality Psychology. Affective Science Series, SAGE.

Cacioppo, John T., Louis G. Tassinary, and Gary Berntson, eds. *Handbook of psychophysiology*. Cambridge University Press, 2007.

Module 2: The Electrodermal System and Sweat Gland Activity			
W 2/3	Skin Conductance	Theory and Criticisms	
M 2/8	Skin Conductance	Methods & Analysis	
W 2/10	Skin Conductance	**Lab:** Methods & Scoring Workshop	

Reading List:
* = Assigned reading; all other readings supplemental

Kylliäinen, Anneli, and Jari K. Hietanen. "Skin conductance responses to another person's gaze in children with autism." *Journal of autism and developmental disorders* 36.4 (2006): 517-525.

Epstein, Seymour, and Armen Roupenian. "Heart rate and skin conductance during experimentally induced anxiety: The effect of uncertainty about receiving a noxious stimulus." *Journal of Personality and Social Psychology* 16.1 (1970): 20.

Esteves, Francisco, et al. "Nonconscious associative learning: Pavlovian conditioning of skin conductance responses to masked fear-relevant facial stimuli." *Psychophysiology* 31.4 (1994): 375-385.

Armel, K. Carrie, and Vilayanur S. Ramachandran. "Projecting sensations to external objects: evidence from skin conductance response." *Proceedings of the Royal Society of London B: Biological Sciences* 270.1523 (2003): 1499-1506.

Williams, Leanne M., et al. "Arousal dissociates amygdala and hippocampal fear responses: evidence from simultaneous fMRI and skin conductance recording." *Neuroimage* 14.5 (2001): 1070-1079.

Module 3: Heart Rate Variability and the Parasympathetic Nervous System			
M 2/15	Heart Rate Variability	Introduction to HRV and Polyvagal Theory	**Lab 1 Due**
W 2/17	Heart Rate Variability	Data Scoring and Analysis	
M 2/22	Heart Rate Variability	**Lab:** Methods & Scoring Workshop I	
W 2/24	Heart Rate Variability	**Lab:** Methods & Scoring Workshop II	

Reading List:
* = Assigned reading; all other readings supplemental

Porges, S. W. (2003). The polyvagal theory: Phylogenetic contributions to social behavior. *Physiology & Behavior*, *79*(3), 503-513.

Porges, S. W. (2009). The polyvagal theory: new insights into adaptive reactions of the autonomic nervous system. *Cleveland Clinic Journal of Medicine*, *76*, S86.

Appelhans, B. M., & Luecken, L. J. (2006). Heart rate variability as an index of regulated emotional responding. *Review of general psychology*, *10*, 229.

Muhtadie, L., *Koslov, K., *Akinola M., & Mendes, W. B. (in press). Vagal flexibility: A physiological predictor of social sensitivity. Journal of Personality and Social Psychology.

Porges, S. W. (1995). Cardiac vagal tone: a physiological index of stress. *Neuroscience & Biobehavioral Reviews*, *19*(2), 225-233.

Gramzow, R., *Willard, G., & Mendes, W. B. (2008). Big tales and cool heads: Academic exaggeration is related to cardiac vagal reactivity. Emotion, 8, 138-144.

Grossman, P., Kollai, M. (1993). Respiratory sinus arrhythmia, cardiac vagal tone, and respiration: Within-and between-individual relations. *Psychophysiology*, 30, 486-495.

Module 4: Impedance Cardiography and the Sympathetic Nervous System			
M 2/29	Impedance Cardiography	Theory and Methods	**Lab 2 Due**
W 3/2	Impedance Cardiography	Data Scoring and Analysis	
M 3/7	Impedance Cardiography	**Lab:** Methods & Scoring Workshop I	
W 3/9	Impedance Cardiography	**Lab:** Methods & Scoring Workshop II	

M 3/14	*No Class*		Spring Break
W 3/16	*No Class*		Spring Break

Reading List:
* = Assigned reading; all other readings supplemental

Kubicek, W. G., Patterson, R. P., & Witsoe, D. A. (1970). Impedance cardiography as a noninvasive method of monitoring cardiac function and other parameters of the cardiovascular system*. *Annals of the New York Academy of Sciences*, *170*(2), 724-732.

Kelsey, R. M. (2012). Beta-adrenergic cardiovascular reactivity and adaptation to stress: The cardiac pre-ejection period as an index of effort.

Cokkinos, D. V., Heimonas, E. T., Demopoulos, J. N., Harralambakis, A., Tsartsalis, G., & Gardikas, C. D. (1976). Influence of heart rate increase on uncorrected pre-ejection period/left ventricular ejection time (PEP/LVET) ratio in normal individuals. *British heart journal*, *38*(7), 683-688.

Newlin, D. B., & Levenson, R. W. (1979). Pre-ejection Period: Measuring Beta-adrenergic Influences Upon the Heart. *Psychophysiology*, *16*(6), 546-552.

Mendes, W. B. (2009). Assessing the autonomic nervous system. In: E. Harmon-Jones and J.S. Beer (Eds.) Methods in social neuroscience, (pp.118-147). New York, NY: Guilford Press.

Waters, S. F., West, T., & Mendes, W. B. (2014). Stress contagion: Physiological covariation between mothers and infants. Psychological Science, 25, 934-942.

Kassam, K., *Koslov, K., & Mendes, W. B. (2009). Decisions under distress: Stress profiles influence anchoring and adjustment. Psychological Science, 20, 1394-1399.

Module 4: The Neuroendocrine System and Salivary Hormones			
M 3/21	Cortisol, DHEA-S, and Testosterone	Theory and Methods	**Lab 3 Due**
W 3/23	Cortisol, DHEA-S, and Testosterone	**Lab:** Data Scoring and Analysis	

Reading List:
* = Assigned reading; all other readings supplemental

Mehta, P.H. & Prasad, S. (2015). The dual-hormone hypothesis: A brief review and future research agenda. *Current Opinion in Behavioral Sciences 3*, 163-168.

Welker, K.M., Gruber, J., Mehta, P.H. (2015). A positive affective neuroendocrinology (PANE) approach to reward and behavioral dysregulation. *Frontiers in Psychiatry, 6*, 1-13.

Hellhammer, D. H., Wüst, S., & Kudielka, B. M. (2009). Salivary cortisol as a biomarker in stress research. *Psychoneuroendocrinology*, *34*(2), 163-171.

Mendes, W. B., Gray, H., Mendoza-Denton, R., Major, B. & Epel, E. (2007). Why egalitarianism might be good

for your health: Physiological thriving during stressful intergroup encounters. Psychological Science, 18, 991-998.

Akinola, M. & Mendes, W. B (2014). It's good to be the king: Neurobiological benefits of higher social standing. Social and Personality Psychological Science, 5, 43-51.

Carpenter, L. L., Carvalho, J. P., Tyrka, A. R., Wier, L. M., Mello, A. F., Mello, M. F., ... & Price, L. H. (2007). Decreased adrenocorticotropic hormone and cortisol responses to stress in healthy adults reporting significant childhood maltreatment. *Biological psychiatry*, *62*, 1080-1087.

Josephs, R. A., Newman, M. L., Brown, R. P., & Beer, J. M. (2003). Status, testosterone, and human intellectual performance stereotype threat as status concern. *Psychological Science*, *14*, 158-163.

Josephs, R. A., Sellers, J. G., Newman, M. L., & Mehta, P. H. (2006). The mismatch effect: when testosterone and status are at odds. *Journal of Personality and Social Psychology*, *90*, 999.

Townsend, S. M., Gangi, C., Major, B., & Mendes, W. B. (2011). From "in the air" to "under the skin": Cortisol responses to social identity threat. *Personality and Social Psychology Bulletin, 37,* 151-164.

Module 5: Blood Pressure and Hemodynamics			
M 3/28	Blood Pressure	Theory and Methods	**Lab 4 Due**
W 3/30	Blood Pressure	Data Scoring and Analysis	
M 4/4	Blood Pressure	**Lab:** Methods & Scoring Workshop	

Reading List:
* = Assigned reading; all other readings supplemental

Matthews, Karen A., et al. "Blood pressure reactivity to psychological stress predicts hypertension in the CARDIA study." *Circulation* 110.1 (2004): 74-78.

Matthews, Karen A., Karen L. Woodall, and Michael T. Allen. "Cardiovascular reactivity to stress predicts future blood pressure status." *Hypertension* 22.4 (1993): 479-485.

Hawkley, Louise C., et al. "Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults." *Psychology and aging* 25.1 (2010): 132.
Suls, Jerry, C. K. Wan, and Paul T. Costa. "Relationship of trait anger to resting blood pressure: a meta-analysis." *Health psychology* 14.5 (1995): 444.

Blascovich, J., Spencer, S. J., Quinn, D., & Steele, C. (2001). African Americans and high blood pressure: The role of stereotype threat. *Psychological science*, *12*(3), 225-229.

Module 6: Muscle Activity and Electromyography			
W 4/7	Facial Electromyography (EMG)	Theory and Methods	**Lab 5 Due** Guest Instructor: Laurel Gabbard-Durnam

M 4/11	Facial Electromyography (EMG)	Data Scoring and Analysis	Guest Instructor: Laurel Gabbard-Durnam
W 4/13	Facial Electromyography (EMG)	**Lab:** Methods & Scoring Workshop	Guest Instructor: Laurel Gabbard-Durnam

Reading List:
* = Assigned reading; all other readings supplemental

Cacioppo, J. T., Petty, R. E., Losch, M. E., & Kim, H. S. (1986). Electromyographic activity over facial muscle regions can differentiate the valence and intensity of affective reactions. *Journal of personality and social psychology*, *50*(2), 260.

Ekman, P., & Friesen, W. V. (1982). Felt, false, and miserable smiles. *Journal of nonverbal behavior*, *6*(4), 238-252.

Wu, Y., & Clark, L. (2015). Disappointment and regret enhance corrugator reactivity in a gambling task. *Psychophysiology*, *52*(4), 518-523.

Dimberg, U., Andréasson, P., & Thunberg, M. (2015). Emotional empathy and facial reactions to facial expressions. *Journal of Psychophysiology*.

Dimberg, U., Thunberg, M., & Elmehed, K. (2000). Unconscious facial reactions to emotional facial expressions. *Psychological science*, *11*(1), 86-89.

Topolinski, S., & Strack, F. (2015). Corrugator activity confirms immediate negative affect in surprise. *Frontiers in psychology*, *6*.

Dimberg, U., & Lundquist, L. O. (1990). Gender differences in facial reactions to facial expressions. *Biological psychology*, *30*(2), 151-159.

Mendes, W. B. & Koslov, K. (2013). Brittle smiles: Positive biases towards stigmatized and outgroup targets. Journal of Experimental Psychology: General, 142, 923-933.

Module 6: Research Proposals and Presentations			
M 4/18	Wrap-Up	Course Wrap-Up / Summary of additional psychophysiology methods not covered in course	**Lab 6 Due**
W 4/20	Final Presentations	Final Presentations	
M 4/25	Final Presentations	Final Presentations	
W 4/27	Final Presentations	Final Presentations	
M 5/2	Final Presentations	Final Presentations	Research Proposals Due