Cognitive Science
FACULTY OF PSYCHOLOGY UW
INSTITUTE OF PHILOSOPHY UW

UNIVERSITY OF WARSAW

Course syllabus

Course title	Methods in neuroscience
Instructor(s)	dr Marcin Lesniak, dr Anna Anzulewicz, dr Agnieszka Pluta
Contact details	marcin.lesniak@psych.uw.edu.pl
Affiliation	Faculty of Psychology, University of Warsaw
Course format	lecture
Number of hours	30 hours
Number of ECTS credits	3 ECTS credits 90 h = 30 h = lecture attendance 30 h = reading weekly assignments 30 h = exam preparation
Brief course description	The aim of the lecture is to introduce students to the wide range of methods which are used in cognitive neuroscience to study brain – behavior relationship. Furthermore, specific applications as well as strengths and limitations of each method will be discussed.
Full course description	Cognitive neuroscience is an interdisciplinary field, which aims to investigate neural underpinnings of brain-behavior relationship. To achieve this goal, a wide arrange of methods, ranging from traditional lesion studies to multimodal neuroimaging methods. During the course students will be introduced to the methods used in the cognitive neuroscience research, including behavioral and psychophysics paradigms, neuropsychological lesion studies, psychophysiological and neurophysiological methods, noninvasive brain stimulation methods, and neuroimaging methods. Both theoretical foundations and practical issues linked to the use of each of the method will be discussed. Furthermore, strengths and shortcomings of each method will be presented to enable students to make informed methodological decision while planning their own experiments.
Learning outcomes	Course should enable students to: - understand the mechanisms and applications of the most commonly used methods in cognitive neurosicence (K_W01; K_W02; K_W05; K_W06; K_W07; K_W07)

	- knows the strenghts and limitations of each method (K_U01; K_K06; K_K02) - be able to critically evaluate methodology of cognitive neuroscience research (K_U01; K_U07; K_K06; K_K01; K_K02) - be able to choose adequate method to be applied in their future research work (K_U02; K_U10)
Learning activities and teaching methods	The lecture will be interspersed with group discussions. All of the students will be invited to contribute to the group discussion, which will be based on the assigned readings.
List of topics/classes and bibliography	Topics: 1. Introduction to neuroscience 2. Behavioral paradigms Jensen, A.R. (2006). Clocking the mind: Mental chronometry and individual differences. Oxford, Elsevier. Chapter 2. 3. Neuropsychological assessment & lesions Vaidya, A. R., Pujara, M. S., Petrides, M., Murray, E. A., & Fellows, L. K. (2019). Lesion Studies in Contemporary Neuroscience. Trends in cognitive sciences, 23(8), 653–671. 4. Meta-analysis Çoğaltay, N., Karadağ, E. (2015). Introduction to Meta-Analysis. In: Karadağ E. (ed.) *Leadership and Organizational Outcomes. Springer,* pp. 19-28. Gordon, C. L., Cobb, P. R., & Balasubramaniam, R. (2018). Recruitment of the motor system during music listening: An ALE meta-analysis of fMRI data. *PloS one, 13*(11), e0207213. 5-6. Psychophysiology Shaffer, F., McCraty, R., & Zerr, C. L. (2014). A healthy heart is not a metronome: an integrative review of the heart's anatomy and heart rate variability. Frontiers in psychology, 5, 1040. Torous, J., Onnela, J. P., & Keshavan, M. (2017). New dimensions and new tools to realize the potential of RDoC: digital phenotyping via smartphones and connected devices. Translational psychiatry, 7(3), e1053. Seagull, J. (2015). Methods and Applications of Eye Tracking. In: Hoffman, R. et al. (ed.) *The Cambridge Handbook of Applied Perception Research*. Cambridge University Press. Chapter 5, pp. 60 – 78.

7-8. EEG and ERPs

Pizzagalli, D. A. (2007). Electroencephalography and high-density electrophysiological source localization. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of psychophysiology* (pp. 56–**73**). Cambridge University Press.

Ibanez, A., Melloni, M., Huepe, D., Helgiu, E., Rivera-Rei, A., Canales-Johnson, A., ... & Moya, A. (2012). What event-related potentials (ERPs) bring to social neuroscience?. Social neuroscience, 7(6), 632-649. (T)

9-10. Noninvasive brain stimulation

Veniero, D., Strüber, D., Thut, G., & Herrmann, C. S. (2019). Noninvasive Brain Stimulation Techniques Can Modulate Cognitive Processing. Organizational Research Methods, 22(1), 116–147.

Filmer, H. L., Dux, P. E., & Mattingley, J. B. (2014). Applications of transcranial direct current stimulation for understanding brain function. Trends in neurosciences, 37(12), 742-753.

11-12. Functional Magnetic Resonance Imaging & Resting-state fMRI:

Soares, J. M., Magalhães, R., Moreira, P. S., Sousa, A., Ganz, E., Sampaio, A., Alves, V., Marques, P., & Sousa, N. (2016). A Hitchhiker's Guide to Functional Magnetic Resonance Imaging. Frontiers in neuroscience, 10, 515.

Seghier, M. L., Fahim, M. A., & Habak, C. (2019). Educational fMRI: From the Lab to the Classroom. Frontiers in psychology, 10, 2769.

Smitha, K. A., Akhil Raja, K., Arun, K. M., Rajesh, P. G., Thomas, B., Kapilamoorthy, T. R., & Kesavadas, C. (2017). Resting state fMRI: A review on methods in resting state connectivity analysis and resting state networks. The neuroradiology journal, 30(4), 305–317.

13. Functional Near Infrared Spectroscopy (fNIRS)

Chen, W. L., Wagner, J., Heugel, N., Sugar, J., Lee, Y. W., Conant, L., Malloy, M., Heffernan, J., Quirk, B., Zinos, A., Beardsley, S. A., Prost, R., & Whelan, H. T. (2020). Functional Near-Infrared Spectroscopy and Its Clinical Application in the Field of Neuroscience: Advances and Future Directions. Frontiers in neuroscience, 14, 724.

Assessment methods and criteria	**Written test (100%)** consisting of single choice and short answer questions. The final test will be graded based on the following criteria: 95% or more = 5! 90-94% = 5 80-89% = 4.5 70-79% = 4 60-69% = 3.5 50-59% = 3 below 50% = 2 (fail)
Attendance rules	Maximum 2 unexcused absences are allowed, missing more than 4 lectures is equivalent to the course failure
Prerequisites	-
Academic honesty	Students must respect the principles of academic integrity. Cheating and plagiarism (including copying work from other students, internet or other sources) are serious violations that are punishable and instructors are required to report all cases to the administration.
Remarks	-