SP H 588C
Electrophysiology of Perception and Cognition and Evaluation of Auditory Processing
Spring 2015

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Class Meeting for lecture and labs: MW 10:00 a.m.-12:00 p.m.

This course is being taught in two parts, the first part with an emphasis on electrophysiology, and the second part with emphasis on auditory processing disorders. Part I is under the direction of Dr. Cone and Part II, commencing April 6, is under the direction of Dr. Musiek. Students should be enrolled in 2 units of 599 with Dr. Musiek, in addition to the 2 units of 588c.

Course Overview: Students will participate in lecture, discussion, and labs regarding the the neurophysiologic bases of auditory evoked potentials and the way they are applied in research and in clinic to evaluate perception, cognition, auditory processing and their disorders. Students will learn the theory and technique of speech evoked ABRs, middle latency responses (MLR), 40-Hz ASSRs, obligatory and cognitive event-related potentials (ERP) and speech-evoked ABRs. The lab practica sessions will give participants the opportunity to learn proper technique for obtaining high quality evoked potential responses. Understanding the acoustic and pathologic variables that can affect the latency, amplitude, and morphology of auditory evoked potentials is paramount. The practica sessions will give participants the opportunity to learn proper technique for obtaining high quality evoked potential responses. Throughout the course, critical review of the literature will be required and synthesis of material regarding application of electrophysiologic and behavioral measures in the clinic.

Learner Outcomes
As a result of completing the assigned reading, attending lecture and participating in discussion and labs the learner will be able to:

1) Define the principles of signal processing for auditory evoked potentials.
2) Calculate the amount of amplification, number of averages, filtering requirements and the artifact reject levels needed to obtain the Speech-evoked ABR, MLR, 40-Hz ASSR, CAEP, P300, and MMN.
3) Define the neural generators of the speech evoked ABR, MLR, 40-Hz ASSR, CAEP, P300 and MMN.
4) Discuss the stimulus variables, particularly the use of complex and speech stimuli, that affect the latency and amplitude of ABR, MLR, 40-Hz ASSR, CAEP, P300 and MMN.
5) Discuss the subject-related variables, including subject state (including attention) and age that affect the latency and amplitude of the MLR, 40-Hz ASSR, CAEP, P300 and MMN.
6) Summarize the effect of hearing loss on the MLR, 40-Hz ASSR, CAEP, P300 and MMN.
7) Analyze, interpret and summarize the results of MLR, 40-Hz ASSR, CAEP, P300 and MMN tests.
8) Compose/prescribe MLR, 40-Hz ASSR, CAEP, P300 and MMN test protocols that can be used clinically.
9) Perform, analyze, interpret and summarize an MLR, 40-Hz ASSR, CAEP, P300 and MMN test on a normally-hearing adult.
10) Critique the literature pertaining to clinical applications of MLR, 40-Hz ASSR, CAEP, P300, MMN and speech-evoked ABR tests.
11) Propose a research need for each of the evoked potentials pertaining to their clinical applications.
12) Review and critique standardized methods of assessing auditory processing abilities.
13) Outline key behavioral and electrophysiologic tests of central auditory function.
14) Discuss key interpretive principles in CAPD.
15) Discuss main interventions for CAPD.
16) List various types of CAPD.

Lecture and Lab Schedule

1 Wed 14 Jan Signal processing for AEPs; Review of Brainstem anatomy/physiology

Monday 19 Jan. 2015 The Reverend Martin Luther King Birthday Holiday

2 Wed 21 Jan Anatomy and physiology of auditory pathway from IC: auditory thalamus and auditory cortex---Musiek

3 Monday Jan 26 Speech Evoked ABR

4 Wed Jan 28 Speech Evoked ABR lab

5 Mon 2 Feb MLR I ---Musiek

6 Wed 4 Feb MLR II ---Musiek

7 Mon 9 Feb MLR Lab

8 Wed 11 Feb 40 Hz ASSR

9 Mon 16 Feb: 40 Hz ASSR Lab

10 Wed Feb 18 CAEP normal response CAEP development, pathologic correlates, clinical applications, research needs.

11 Mon 23 Feb 3 Written assignment I

12 Wed 25 Feb Lab III CAEP (P1, N1, P2)

13 Mon 2 March Acoustic Change Complex

14) Wed 4 March Mar Lab IV ACC Lab

15) Mon 9 Mismatch Negativity (MMN)

16 Wed Mar 11 Anatomy and physiology of cognition and listening-Musiek

March 16-22 Spring Break
17 Mon 23 Mar Lab V MMN

18 Wed 25 Mar P300

19 Mon 30 Mar Lab IV P300

20 Wed 1 April Brain Mapping and multi-channel arrays

21 Mon April 6 – Philosophy, Etiology, Clinic populations for APD, Questionnaires and history forms, characteristics of APD. **READINGS:** Bamiou, Musiek, Luxon (2001).


23 Mon April 13 – Dichotic listening con’t

24 Wed April 15 - Temporal processing: types of, association with neurologic function,tests (frequency & duration patterns, GIN, click fusion, test efficiency, gen. comments). **READINGS:** Musiek & Chermak chapter 15: Neff, Butler, Diamond, 1961 = optional

25 Mon April 20 – Temporal processing con’t


27 Mon April 27 - Binaural interactions: MLDs, lateralization, localization. **READINGS:** Musiek & Chermak, chapter 16, and Learning by Case studies

28 Wed April 29 - Test battery considerations, consequences, and calculations, corpus callosum, effects of peripheral hearing loss, test battery efficiency. **READINGS:** Musiek & Chermak, chapter 11, and Learning by case studies

29 Mon May 4 – Introduction to intervention, philosophy, auditory plasticity, peripheral vs. central system rehabilitation. Over view of selected AT procedures. **READINGS:** Chermak & Musiek, Vol. II, chapter 4, 6, 7

30 Wed May 6 – Dichotic, Temporal, educational interface intervention techniques

**Final Exam** is on Friday 8 May, 10:30-12:30 a.m.

**The required texts are:**


In addition to the required texts, there are over 120 journal articles provided in PDF form on the D2L web-site. There will be required reading from this set of articles.

**Students will be assessed on the basis of the following assignments:**

2 Written assignments for Part 1, each worth 15%, 30% total  
Lab Assignments and write-ups: 20%  
1 Oral presentation (see report topics, below): 10%  
Research paper (see report topics, below): 20%  
Final: 20%

**Report topics:** The purpose of this exercise is to have the student report on a mini topic in ~5 minutes. Different than a class report, the focus is on relating key issues about the topic in a learnable manner. One can select from the topic below or think of one. The topic must be approved by the instructor. This presentation needs to have an accompanying paper handed in at the time of the presentation. The paper should be 6 – 8 double spaced pages not including refs or tables & figures. All papers should have at least 1 figure.

1. acoustical effects on dichotic listening  
2. early background on LTP  
3. Webster & Webster: their contributions to auditory plasticity  
4. Short tone frequency discrimination (Cranford)  
5. fMRI or PET and dichotic listening?  
6. What is Earobics?  
7. Tran-synaptic degeneration or effects of unilateral deafness on the central auditory system  
8. Central deafness  
9. Heffner & Heffner: their impact on Central Auditory Processing  
10. Agenesis of the corpus callosum  
11. Topics from Neuroaudiology.com  
12. Selected topics from Dr. Tim Griffiths website  
13. The APDQ (Brian O'Hara)  
14. Interview with Gail Chermak  
15. Interesting case studies in central disorders  
16. George Gates, Aging, Alzheimers, and CAPD  
17. AAA Guidelines for Diagnosis and Intervention for (C)APD  
18. Auditory discrimination and SLI in children  
19. Music, musical training and CAPD  
20. Auditory neglect  
21. The ABR BIC in brainstem disorders (stroke, MS,) (see Pratt and others)  
22. The Acoustic change complex evoked potential  
23. Jerger’s contributions to CAPD & neuroaudiology (selected)  
24. Ectopic areas, polymicrogyri, & CAPD (Galaburda)
Policies:

If you need to be absent from lecture or lab, please contact Dr. Cone via e-mail as soon as possible.

Absences due to health issues and religious observances are always honored and plans for accommodating these will be made.

Absences with prior approval from the Dean of Students office will be honored.

Students are expected to abide by the Student Code of Academic Integrity: (http://deanofstudents.arizona.edu/codeofacademicintegrity).

Students are expected to abide by the University policy regarding threatening behavior:

http://policy.web.arizona.edu/threatening-behavior-students

Accessibility and Accommodations:

It is the University’s goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations.

The information contained on this syllabus may be amended by the instructor with reasonable notice given to students.