COGS 179/279  
Electrophysiology of Cognition:  
Language Processing

http://www.cogsci.ucsd.edu/~coulson/cogs179/  
(links to PDF of these slides available online)

Contact Info

• Dr. Coulson  
• Office Hours  
  – CSB 161  
  – Monday/Wednesday 3-4pm  
  – Or, by appointment  
• Email  
  – coulson “at” cogsci.ucsd.edu

Course Description

• Survey use of electrical and magnetic brain activity to study cognition  
• Learn how electrophysiological techniques used to address issues in cognitive science  
• Practice critical reading research reports and reviews  
• Develop a research idea and write a proposal

What we’re shooting for…

• Understand technical and theoretical aspects of electrophys recordings  
• Identify how electrophys methods have contributed to cognitive science  
• Evaluate research reports in the area  
• Develop an interesting research question  
• Write a proposal for an electrophys research project that might help answer your question

Reading Review Articles

• Cover lots and lots of research  
• What are the research issues?  
• How has EEG been used to date?  
• What are typical designs in this area?  
• What aspects of the EEG signal have been of interest?  
• What insights about cognitive neuroscience have been obtained?

Reading Research Reports

• What is the goal of the study?  
• What is their hypothesis?  
• How does the experiment address the hypothesis?  
• What are possible outcomes and what might each mean?  
• What was the actual outcome?  
• What did the authors conclude?  
• Do you agree with the authors? Are there alternative explanations?  
• What are further questions that need to be addressed?
Getting Readings

- Links to all PDFs available very soon on on-line syllabus
- Articles available soon at reserve desk at Geisel Library
- Interested in a Course Reader w/all readings for COGS 179?

Work for 179/279

- 6 Problem Sets (60% of grade)
  - Questions based on the reading and the lectures
  - Due Tuesdays in class (see syllabus for dates)
  - Each worth 10% of your grade
- 3 Proposal Related Papers (20% of grade)
  - 2-page paper about background for your proposed study (Thursday 2/23) (5%)
  - 2-page paper about design of your study (Thursday 3/2) (5%)
  - Final 5-10 page proposal due last day of classes (10%)
- Final Exam (20% of grade)
  - Similar to problem sets

Research Proposal

- Pick a topic in cognitive science amenable to study w/electrophysiological techniques
  - Can be a topic covered in this course
  - Can be a totally different topic in cognitive science
- Read about research in that area
- Summarize research in that area and point to an unanswered question
- Design a study to answer that question
- Describe the design of your study
- Explain how it will answer an important question in this area

Working Together

- Please work together on problem sets
  - Type/write up your own answer
- Ask Coulson about problem sets
  - Office hours: MW 3-4pm in CSB 161 (or by appointment)
  - During class if question relevant to topic of discussion
- Discuss research proposal with instructor & with others
  - Write paper yourself
  - Include names of people who helped you in an acknowledgements section
  - Cite sources, use quote marks when you quote
- Exam: you're on your own

179 vs. 279

- Tuesday/Thursday: everyone
- Friday: grads only (others welcome)
- Extra stuff for grads
  - Some extra problems on homework
  - Extra reading
  - Present an article in Friday section
  - Briefly describe your proposal on the last day of classes (in Friday section)
  - Slightly different exam

Outline

- Background Information
- Analysis & Inferences
- Speech Perception
- Audiovisual Integration
- Language Production
- Semantic Processing: N400
- Interactions between semantics and other aspects of language
- Linguistic vs. Nonlinguistic Meaning
- Pragmatic Processing
- Neural Plasticity
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Analysis of Data

• How is ERP data processed?
• How is ERP data measured?
• What sorts of analysis is best suited for the different sorts of hypotheses tested by cognitive neuroscientists?
Basics of Speech Perception

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Auditory Change Detection

Recent Work in Audiovisual Integration

• Use of MMN to study McGurk effect

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Classic Studies in Audiovisual Integration

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Speech Production
Outline of the theory of speech production developed by William Levelt (1999)

Language Production: LRP

Language Production: Go-NoGo Paradigms

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Semantic Processing and the N400

Neural Generators of the N400

The movie was meant to be a horror flick, but the acting was so bad it was actually funny (cohort congruous) / funnel (cohort incongruous) / penny (rhyme)

Open and Closed Class Words

Linguistic vs. Nonlinguistic Meaning

- Question:
  - Is the same conceptual representation of a robin activated regardless of whether one hears the word robin or sees one flying?
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Pragmatic Processing

- Discourse Context
- Metaphor

Jokes and Puns

Sign Language: Neural Plasticity and Language Experience

General Plasticity Issues

- Does extensive musical experience (as the conductor of an orchestra) affect your ability to direct attention in space?
- Does being blind affect how you attend to auditory information in space?