Intro to Cognitive Neuroscience

Language production
But first, that paper


Language production

- Idea to be conveyed (non-linguistic)
- Selecting words
- Developing sentence structure
- Phonological representation of sentence is developed.
- Actual production of speech
Be a neuroscientist!

• Hypothesis: Language production involves distinct phases.

• Your mission: Design an experiment that would test this hypothesis.

• What’s the IV? The DV? How will you define these such that you can measure them?

• What results would support your hypothesis?
Language centers

• Marsel Meslaum - language circuits in the brain.

• Rote language production uses just motor and pre-motor areas.

• Hearing words activates primary auditory cortex, then unimodal association areas.

[Image: Brain diagram with labels courtesy of Bruno Dubuc, The Brain From Top to Bottom]
Language processing at different levels

• PET scan (subtractive) of participants doing different language tasks.

Image removed due to copyright issues. To see an image of a PET scan of participants doing different language tasks, click on the following link.

http://plato.stanford.edu/entries/innateness-language/PosnerRaichle.jpg
Errors in speech production

• Exchange errors - when two elements of a sentence are transposed.

• Word-exchange error: *I wrote a mother to my letter.*

• Sound-exchange error (aka spoonerism): *You have hissed all my mystery lectures!*

The Capitol Steps, a political humor group, has produced segments called “Lirty Dies” that use exchange errors. Click on the link to see examples.

Grammatical encoding

• Word selection requires relating semantic information from the message to individual words.

• Occasional errors that are a blend of two different words.

• How can you study how sentence syntax develops?
Grammatical encoding

• Language production study disguised as a memory experiment.

• Bock hypothesized that some words are quicker to choose, and a sentence structure is created that puts those words first.

• Subjects were shown pictures, instructed to say a sentence out loud about each picture.

• Accessibility of words was modified by priming.
Five-minute writing

- Write a paragraph summarizing a main idea from the reading.
Phonological encoding

• Speaker must retrieve phonological information about each word.

• Tip-of-the-tongue states occur when the connection between the semantic and phonological representation for a word is blocked.

• TOT states are more common for uncommon words.

• Severe TOT states can arise from brain injury.
Phonological and grammatical interactions

• Does information from phonological levels influence grammatical levels?

• Word exchange errors occur more often in words with similar phonemes.
Articulation

• Articulation is basically a matter of very fine motor control.

• A disproportionately large amount of motor cortex is devoted to the lips, jaw, and tongue.
Articulation

• Primary motor cortex (M1) controls fine motor abilities.

• Premotor area sets up sequences of actions, especially in response to perceptual information.

• Supplementary motor area is involved in action plans.
Writing

• Written language tends to vary from spoken language.
  • Often produced in isolation.
  • More complex syntax.
  • Opportunities for revision after production.
Speaking of writing...

- Essay question for this week is changed from that on the syllabus.

- Explain how context is involved in at least two aspects of language processing. You could consider speech perception, ambiguous words and sentences, discourse-level organization, evidence from speech errors, or other aspects of language.