Language

(...and also Development: Preview, if we have time)

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Carnegie Mellon University
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Language

It’s like talking and stuff...
Today’s topics include...

- Structure and use of language
- Stages of language development
- How language develops
  - Nature, nurture, and critical periods
- Language and the brain
- The relationship between thinking and language
LANGUAGE: Definitions

- **Language**
  - Use of symbols to represent, transmit, and store meaning/information.

- **Symbols**
  - Organized patterns of sounds, visual representations, and movements.

- **Meaning**
  - Concepts, quantities, plans, identity, feelings, ideas, facts, and customs.
Language: why is it great?

- We can hear about and understand phenomena we have never experienced.
- We can connect to people far away.
- We can make plans and have others carry them out.
- We can know what another person is thinking more directly than just by observing their behavior.
- We can store information.
Language: what’s it made of?

- **Phonemes**: smallest units of sound (vowels and consonants).
- **Morphemes**: units of meaning, i.e. words and meaningful parts of words such as suffixes, prefixes).
- **Grammar**: rules for using words, including semantics, definitions, connotations, and syntax.
Language: how good are we at it?

Jabberwocky
By Lewis Carroll
'Twas brillig, and the slithy toves
     Did gyre and gimble in the wabe:
All mimsy were the borogoves,
     And the mome raths outgrabe.

“Beware the Jabberwock, my son!
     The jaws that bite, the claws that catch!
Beware the Jubjub bird, and shun
     The frumious Bandersnatch!”

He took his vorpal sword in hand;
     Long time the manxome foe he sought—
So rested he by the Tumtum tree
     And stood awhile in thought.

And, as in uffish thought he stood,
     The Jabberwock, with eyes of flame,
Came whiffling through the tulgey wood,
     And burbled as it came!

One, two! One, two! And through and through
     The vorpal blade went snicker-snack!
He left it dead, and with its head
     He went galumphing back.

“And hast thou slain the Jabberwock?
     Come to my arms, my beamish boy!
O frabjous day! Callooh! Callay!”
     He chortled in his joy.

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Language: How do we learn it?

- We acquire the use of **10 new words per day** (on average) between ages 2 and 18.
- Children learn the basic grammar of language before they can add 2 + 2.
- Research suggests that babies are learning the names of common words at 6 months.
## Language Stages

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Babbling
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<td>24+ months, 2+ years</td>
<td>Speaking full sentences and understanding complex sentences</td>
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Critical Periods

• Is the ability to acquire language biologically linked to age?

• **Critical periods**: claim that there is an ideal time window to acquire language in a linguistically rich environment, after which further language acquisition becomes much more difficult and effortful
According to one study with immigrants, beginning a language later made it harder to learn the pronunciation and the grammar of the second language.
Critical Periods

- Genie: An abandoned child found when she was 13
- Important to begin appropriate language exposure/education early so that language centers of the brain continue to develop
- If not begun by age 7, language might never develop
Language: Lessons from Brain Damage

• **Aphasia**: an impairment in the ability to produce or understand language

• Usually caused by damage to the brain

• Can include:
  – ability to speak but not read
  – ability to produce words in song but not in conversation, and to speak but not repeat
  – producing words in jumbled order
Damage to Broca’s area leads to difficulty in putting words together in sentences or even speaking single words, although a person can sing a song.
Broca’s (expressive) aphasia
Damage to Wernicke’s area leads to difficulty comprehending speech and producing coherent speech (not easily monitoring one’s own speech to make sure it makes sense).
Wernicke’s (fluent) aphasia
Let’s practice for thinking like we’re taking an exam...

It turns out that people with Wernicke’s aphasia and people with Broca’s aphasia both have a very difficult time repeating back something another person says to them.

Why would a person with each type of aphasia have difficulty repeating someone else’s spoken words?
Language Influences Thought

• **Linguistic determinism:** the idea that our specific language determines how we think

• Benjamin Whorf and the Hopi

• Can you think about something that you do not have a name for? If so, does that disprove linguistic determinism?
Language Influences Thought

Color Perception

- Native language used to *classify* and to *remember* colors
- Different languages may vary in separation between “blue” and “green,” or may not have separate words for these colors
Language Influences Thought

Gender and Language

- Chestnut and Markman study
  - Subject-complement structure
    - “My mom met Justin Bieber” v. “Justin Bieber met my mom”
  - Girls and boys math abilities
    - Placing girls as subject increased endorsement of stereotype
Language Influences Thought

The “bilingual advantage”

• Bilingual people build numerous brain connections and neural networks

• Hidden talent: ability to suppress one language while learning another

• This ability tends to go along with other forms of executive control, such as resisting distraction and inhibiting impulses
But Thought Also Influences Language?! 

Complexity

• Lewis & Frank (2016) study
  
  • Arbitrary relationship between sounds of words and their meaning
    
    • Is a horse anything like the word “horse”? 
  
  • Are the forms of words (e.g., word length) systematically related to their meaning?
    
    • In other words... are complicated concepts represented by complicated words?
Experimental Task

[Image of a bowl and a robot with a watermelon in a transparent dome]
A lab study is nice and all... but what about in natural language?
Language and Thought... Influence One Another

Emotions

• Japanese has many extra words for interpersonal emotions such as sympathy and empathy, which Americans might have trouble differentiating.

• English has many words for self-focused emotions (e.g., sadness)
Now you know...

• Children rapidly develop their language abilities, and they do so through stages.

• There seem to be critical periods that affect the ability to learn language.

• Brain damage affects linguistic capabilities, and tell us about the functions of different brain regions.

• Language and thinking influence one another.