Language and Communication

PSYC 313 - Lecture 14
Dr. J. Nicol

Language

- It is possible to transmit our thoughts to other people because we have the ability to understand words and then string them together to express them

- **Language:** a system of communication, using sounds or symbols that enables us to express our feelings, thoughts, ideas, and experiences

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Language is Universal

- Language exists in all cultures on earth (i.e., there are more than 5,000 different languages and there isn't a single culture that does not use language)

- Everyone with normal intellectual capacities develops language and learns to follow its complex grammatical rules, even though they are usually not consciously aware of the rules

Language is Universal

- The development of language is similar across all cultures (i.e., meaningful words appear around age 1, and the first multiword utterances around age 2)

- As humans, our need to communicate is so powerful that when deaf children grow up in an environment where no one uses sign language, they invent a sign language themselves (Goldin-Meadow, 1982)

What is Language?

- **Psycholinguistics:** the field of cognitive psychology concerned with the study of language

- The goal of psycholinguistics is to discover the psychological processes by which humans acquire, process, and use language
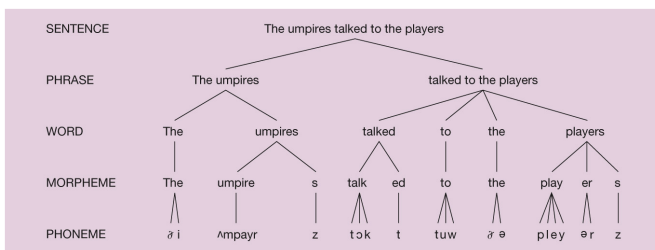
What is Language?

- *Language is communicative*

- Although we communicate our ideas and feelings with each other in many ways, such as posture, and facial expressions, language is certainly an important one

- *Language is referential and meaningful*

- Language is like a direct expression of how we represent the world in our minds

What is Language?

- *Language is structured (i.e., rule-based)*
- What we say has meaning because of the words we use, but also because of the way the words are combined
- Rules about how to structure sentences are known as *syntax*, which is a subcomponent of what is called *grammar*, the broader set of rules governing a given language
- The rule-based nature of language means that the components can be arranged in certain ways, but not in other ways

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The hierarchical nature of language means that it consists of small components that can be combined to form larger units (i.e., words can be combined into phrases, and phrases can be combined into sentences)

SENTENCE	The umpires talked to the players					
PHRASE	The umpires		talked to the players			
WORD	The	umpires	talked	to	the	players
MORPHEME	The	umpire s	talk ed	to	the	play er s
PHONEME	ð i	ʌmpayr z	tɔk t	tuw	ð ə	pley ər z

What is Language?

- *Language is creative*
- It allows for the creation of meaningful, never-before-spoken sentences
- The *productivity* of language gives us the ability to produce and understand completely new sentences
- Productivity shows that we have internalized a system of rules for how to combine elements into new meanings

Components of Words

- **Phonemes:** the basic units of sound in language (e.g., consonants, vowels); the shortest segment of speech that, if changed, changes the meaning of a word

- **Morpheme:** the smallest unit of meaningful sound in language (e.g., bedrooms: bed-room-s; banana-s)
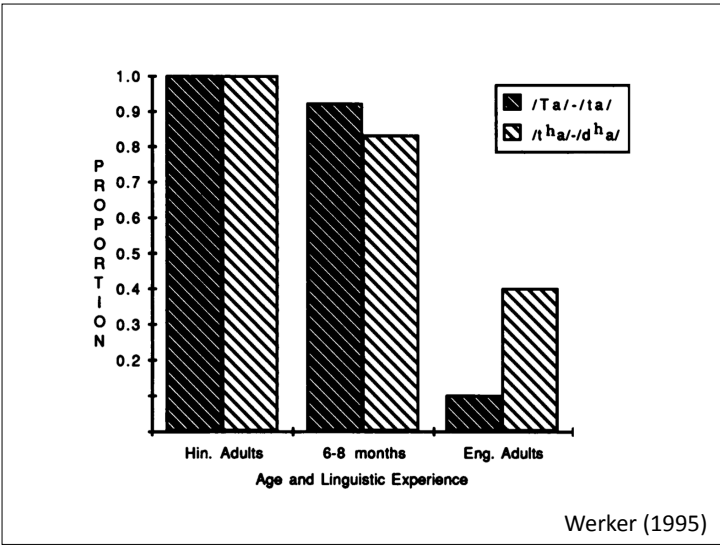
Learning the Sounds of Language

- Evidence suggests that infants can distinguish among a wider array of phonemes than adults can (Werker, 1995)

- The process of learning when phonetic differences are relevant for one's native language is known as the **native language magnet effect** (Kuhl, 2000)
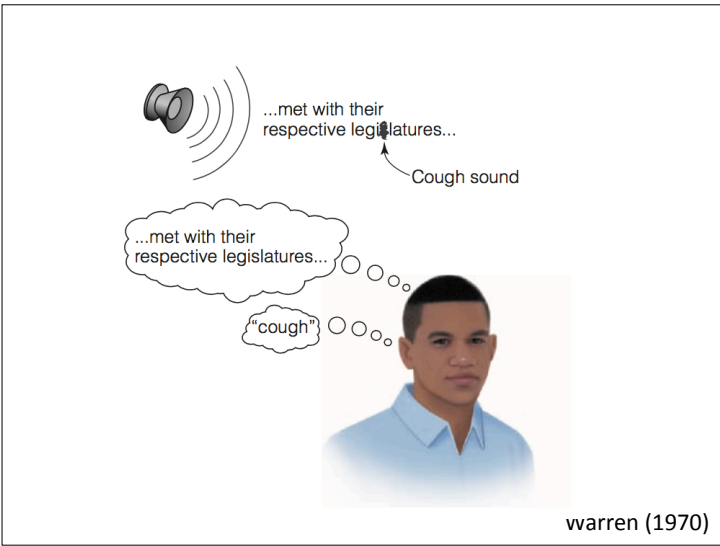
Infants appear to enter the world prepared to tune to the sounds of any language, but the ability to discriminate between phonemes in their non-native language diminishes within the first year of life
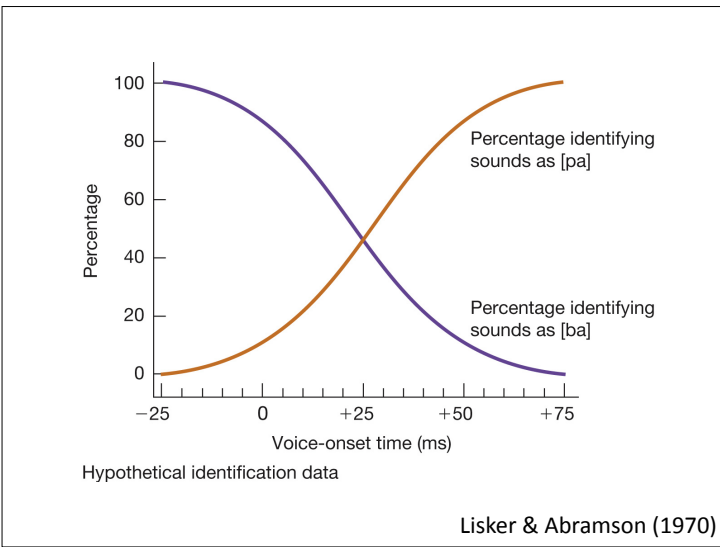
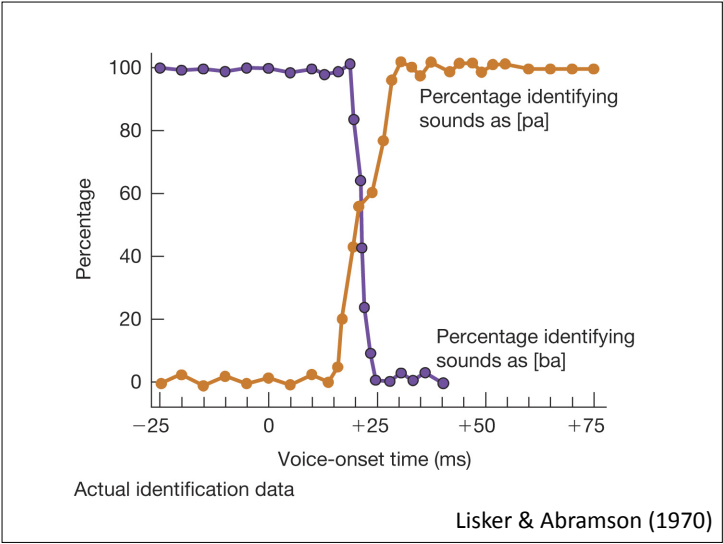Infant discrimination performance on two non-English speech contrasts

| Reached criterion	6–8 months	8–10 months	10–12 months
The retroflex/dental contrast /ʈa/-/t̪a/			
Yes	11	8	2
No	1	4	8
The velar/uvular contrast /k̓i/-/q̓i/			
Yes	8	8	1
No	2	6	9

Werker & Tees (1984)

Werker (1995)

...met with their
respective legislatures...

Cough sound

...met with their
respective legislatures...

"cough"

warren (1970)

Percentage identifying
sounds as [pa]

Percentage identifying
sounds as [ba]

Hypothetical identification data

Lisker & Abramson (1970)

100

80

60

Percentage

40

20

0

−25   0   +25   +50   +75

Voice-onset time (ms)

Percentage identifying sounds as [pa]

Percentage identifying sounds as [ba]

Actual identification data

Lisker & Abramson (1970)

Phoneme Perception

- The phenomenon of categorical perception has led some researchers to conclude that speech perception is a specialized kind of auditory perception (Bidelman et al., 2013)

- In other words, the idea is that just like face perception is a specialized kind of visual perception, speech perception is a specialized kind of auditory perception

Speech Perception

- The way people pronounce words in conversational speech makes about half of the words unintelligible when taken out of context and presented alone (Pollack & Pickett, 1964)

- Depending on whether the speaker spoke at a slow, normal, or fast speed, the isolated words were only correctly identified 68% (slow) to 41% (fast) of the time (Miller & Isard, 1963)

Speech perception requires speech segmentation:
*the listener must determine when one word ends and the
next word begins from within a continuous sound signal*
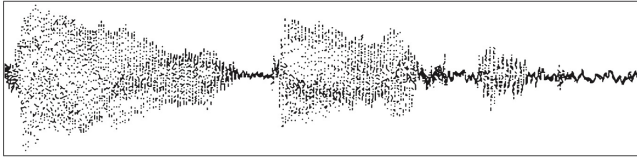
| My | name | is | Dan | Reis | – | berg |

Speech Perception

- Overlapping of speech sounds creates additional problems for perceiving speech because it means the acoustical pattern of the words being spoken is different in different contexts (Lieberman et al., 1967)

- Our process of interpreting language is influenced by the cues available in the environment (Tanenhaus et al., 1995)

Speech Perception

- Although a typical university student in North America knows between 75,000 and 100,000 different words, most of those words are rarely used (Zechmeister et al., 1995)

- Estimated that the 50 most commonly used words in English make up more than half of the words you actually hear in any given day (Miller, 1951)

Language Production

- Speech errors provide insights into how we produce language

- The ways people add or swap sounds in a sentence reveal multiple levels of planning that go into producing a simple phrase

- When we assign a part of speech to an incorrect place in the sentence, we typically exchange it with a component at the same level (e.g., morphemes with morphemes, phonemes with phonemes, words with words)

Language Production

- A common phenomenon known as the **anticipation error** occurs when a phoneme early in a sentence is swapped for a phoneme later in the sentence

- *"You hissed all my mystery lectures and have tasted the whole worm"* instead of *"You have missed all my history lectures and have wasted the whole term"*

- Anticipation errors suggest that the planning of speech sounds and the planning of word placement occur at different stages in language production

Language Production

- Language production involves three primary processes (Levelt, 1989):
  - *A prelinguistic process that selects the message to be communicated*
  - *A process that determines the grammatical structure of the message*
  - *And a process that converts the message and the structure into a sequence of sounds*

Semantic Coordination

- The **given-new contract** states that the speaker constructs sentences so that they include two kinds of information:

  - *Given information* - information that listener already knows; and

  - *New information* - information that the listener is hearing for the first time (Haviland & Clark, 1974)
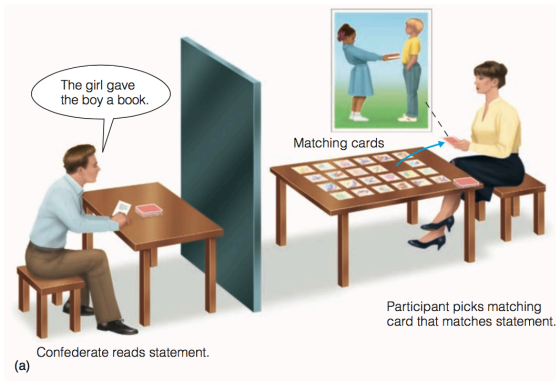
Branigan et al. (2000)

Syntactic priming — *hearing a statement with a particular syntactic construction increases the chances that the next sentence will be produced with the same construction*
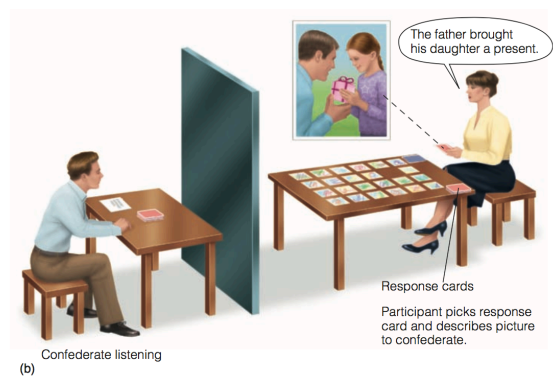
Branigan et al. (2000)

Aphasias

- We have a considerable amount of neural tissue that is specialized for language, and damage to this tissue can disrupt language production, language comprehension, or both

- An impairment of language functioning caused by damage to the brain is called an *aphasia*

Broca's area in the left frontal lobe is critically involved in speech production and *Wernicke's area* in the left temporal lobe is critically involved in language comprehension

Broca's area
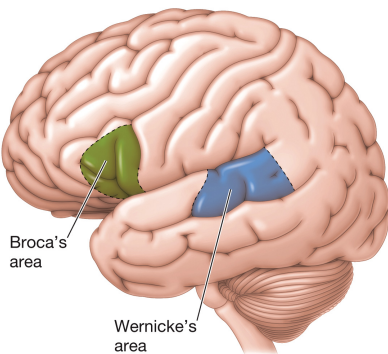
Wernicke's area

Aphasias

- *Broca's aphasia* is characterized by difficulty speaking fluently, producing correct sounds, or finding the right words

- *Wernicke's aphasia* is characterized by difficulty understanding the meaning of words and sentences

- Other types of aphasia can range from relatively mild (e.g., *anomic aphasia*, in which people have difficulty finding the words they want to say) to severe (e.g., *global aphasia* in which people have great difficulty both producing and comprehending spoken language)

Aphasias

- Although Broca and Wernicke made lasting contributions to the study of localization of function, discoveries such as theirs cannot be interpreted in a straightforward way because the aphasias are not well-defined (Marshall & Fink, 2003)

- "Clinical aphasic syndromes are comprised of variable clusters of symptoms, and it is difficult to see how such ill-defined phenomena could be regulated by a precisely located part of the brain" (Marshall & Fink, 2003)


| FORK | → | K XXXXXXXX M |

(a)

| K | → | K XXXXXXXX M |

(b)

| RFOK | → | K XXXXXXXX M |

(c)

Reicher (1969)

Effect	Description	Conclusion
Phonemic restoration	A phoneme in a spoken word in a sentence can be perceived even if it is obscured by noise.	Knowledge of meaning helps "fill in the blanks."
Words isolated from conversational speech	It is difficult to perceive isolated words.	The context provided by the rest of the conversation aids in the perception of words.
Speech segmentation	Individual words are perceived in spoken sentences even though the speech stimulus usually doesn't indicate breaks between words.	Knowledge of the meanings of words in a language and other characteristics of speech, such as sounds that usually go together in a word, help create speech segmentation.
Word superiority	Letters presented visually are easier to recognize when in a word.	Letters are affected by their surroundings.

Understanding Words

- *Word frequency effect* refers to the fact that we respond more rapidly (i.e., more readily perceive) to high-frequency words than to low-frequency words

- In one study that used the lexical decision task, participants read high-frequency words faster than low-frequency words (Savin, 1963)
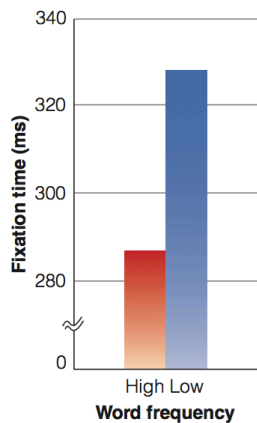
Rayner et al. (2003)

Understanding Words

- Reading is made more difficult by the fact that words can often have more than one meaning, a situation called *lexical ambiguity*

- When ambiguous words appear in a sentence, we rely on the context of the sentence to determine which meaning applies

- We briefly access the multiple meanings of ambiguous words, and then the effect of context takes over (Swinney, 1979)

In a lexical decision task participants were asked to indicate as quickly as possible whether the letter string flashed on the screen was a word or a nonword

". . . and other bugs . . ."

ANT

Flashes when person hears the word "bug"

Lexical decision: Word or nonword?

Swinney (1979)
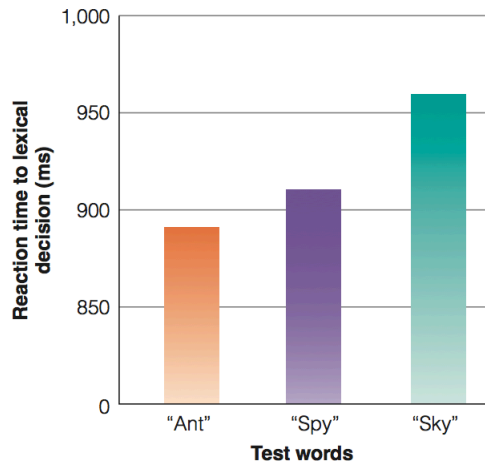
Swinney (1979)

Effect	Description	Conclusion
Word frequency	Words vary in the frequency with which they are used in a particular language (examples: pretty, demure).	High-frequency words are read faster than low-frequency words (lexical decision task; eye movements).
Lexical ambiguity	Many words have more than one meaning (example: bug).	When a word is used in a sentence, multiple meanings are accessed rapidly, but then the content of the sentence quickly determines the correct meaning.

Understanding Text

- The *situation model approach* to text comprehension proposes that the mental representation people form as they read text is a representation of the situation in terms of people, objects, locations, and events that are being described in the story (Johnson-Laird, 1983)

He hammered the nail into the wall.
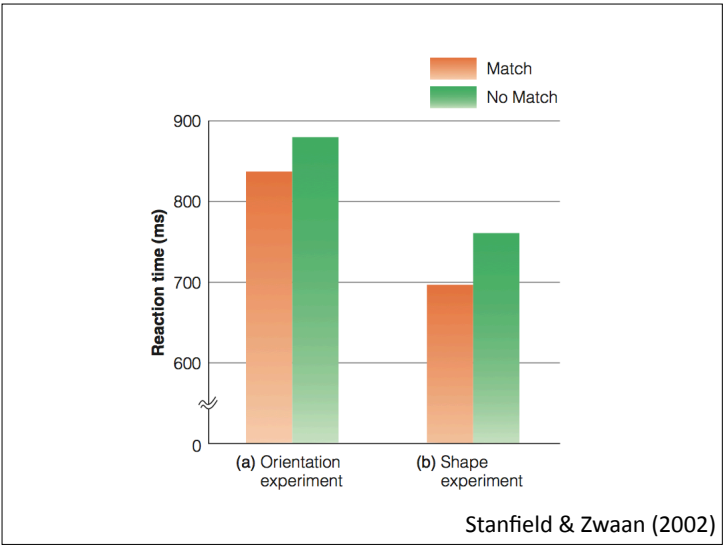
He hammered the nail into the floor.
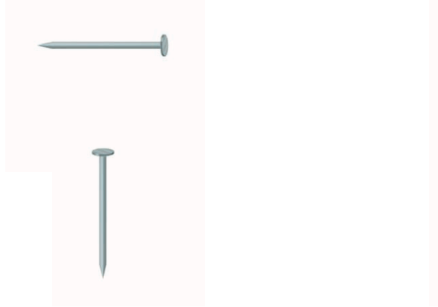
Orientation

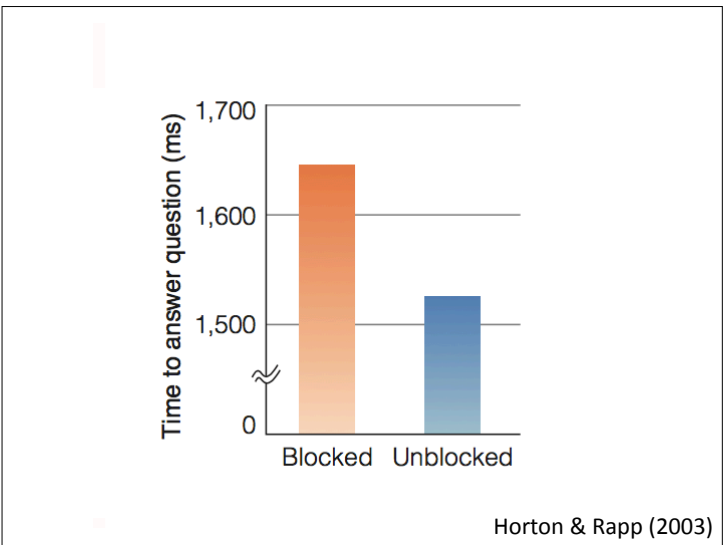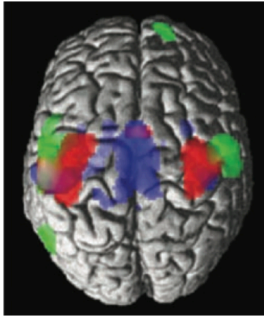*The ranger saw the eagle in the sky.*

The ranger saw the eagle in its nest.

Shape

Stanfield & Zwaan (2002)

Melanie's mother appeared in front of the TV.
She told Melanie not to forget about her homework.

Horton & Rapp (2003)

Horton & Rapp (2003)

Movements

Action Words
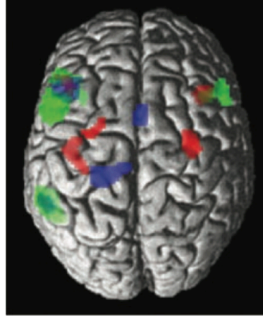
Blue: Foot movements
Red: Finger Movements
Green: Tongue movements

(a)

Blue: Leg words
Red: Arm words
Green: Face words

(b)

Hauk et al. (2004)