Language Acquisition

Thursday, 22 August 2019

Learning Outcomes

By the end of today's lesson, you will be able to:

1. Explain the basic difference between linguistic nativism and empiricism
2. Describe the five major milestones of child language production
3. Discuss the relationship between irregularity and morphological learning
4. Compare and contrast L1 and L2 language acquisition
5. Evaluate which neuroimaging technique (EEG, MEG, fMRI) is best-suited to answer different types of experimental questions

Nativism and Empiricism in Linguistics

Where is language located? Where does language come from?

This conversation has a long history, but we can reduce it to two extreme positions slash bundles of positions for ease of introduction.

Nativism	vs.	**Empiricism**
Nature	vs.	Nurture
Biological	vs.	Social
Mechanisms Specific to Language	vs.	Domain-general Mechanisms

Language production & perception milestones

I. Cooing
a. 0 to 4 months

II. Babbling
a. 5-12 months

III. One-word utterances
a. emergence of first word
b. 9 to 18 months

Language production milestones

- **Pre-babbling / Cooing (0-5 mo.):** vocalizations with no clear consonant-vowel sequences
- **Babbling (6 mo.):** some clear consonant-vowel sequences with no apparent meaning
- **One-word (12 mo.):** nana (banana), allgone, diaper, etc.
- **Two-word (18-24 mo.):** more car, bye-bye car, eat it, see boy
- **Multi-word utterances (~25 mo.)**

Examples from Youtube channel Kids OT Help

The acquisition of morphology

At first, children learn both irregular and regular forms well.

- A 2-yr-old knows the past tense of <go> is <went> (irregular/suppletive) and the past tense of <walk> is <walked> (regular).

Then, the child overgeneralizes and treats all as regular.

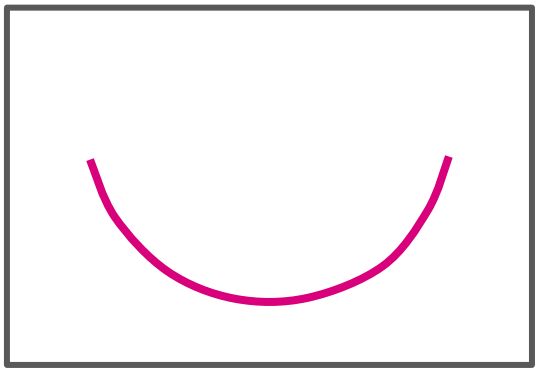
- A 3-yr-old might say the past tense of <go> is <goed>.

Then, around the time kids start school they begin to learn exceptions.

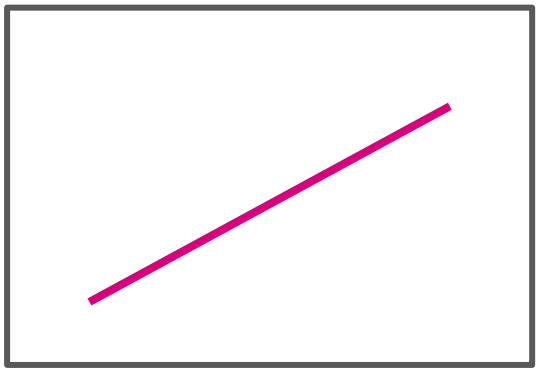
The acquisition of morphology

Why does morphological learning happen like this?

Why does learning look like a U-shaped curve and not like a line?



Actual trajectory of learning over time



Common assumption

The acquisition of morphology

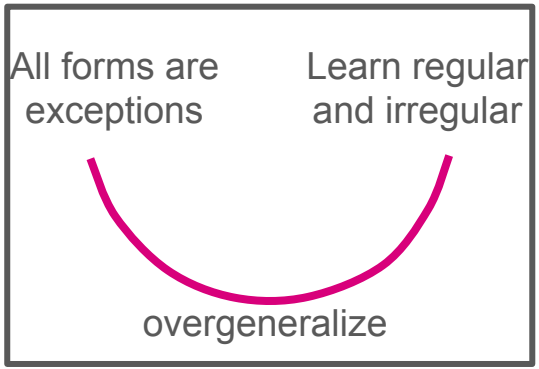
Kids start out learning everything because they are memorizing everything.

They are treating everything like an exception.

Then they learn the rules and **overgeneralize** them.

They treat everything like it's regular.

Then, they sort out which forms are regular and which are irregular.



Actual trajectory of learning over time

Second language acquisition: Roadmap

- Classroom learning not the best example of L2 acquisition
- L2 acquisition is much like L1 acquisition
- Child L2 acquisition is especially like L1 acquisition
- Adult L2 acquisition diverges in certain ways from L1 acquisition

Classroom learning

- Majority of humans speak an L2; few of them learned it in a classroom setting.
- Classroom language instruction is a relatively recent phenomenon.
- It usually involves just the beginning stages of acquisition.

A typical language class

- 3 hours per week
- 30 weeks per year
- 2 years of study

Total: 180 hours of exposure

What can you do in 180 hours?

If you learn 10 words per hour, you will learn 1800 words in 2 years.

Is this a lot?

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Is this a lot?

The average 5-year-old knows 13,000 words
- ~2k active use
- ~11k passive knowledge

The average 18-year-old knows 60,000 words
- ~20k active use
- ~40k passive knowledge

So….

Classroom language learning is worth studying and doing!

But it is only one piece of the larger picture of second language acquisition.

L2 acquisition is much like L1 acquisition

You have to learn the lexicon.

- Typical errors:
  - “Cover the turkey with aluminum paper.”
  - “Would you like some ice for dessert?”

You have to learn the rules.

- Typical errors:
  - “I taked test yesterday”

Child L2 acquisition is especially like L1 acquisition

After arriving in a new language environment, younger children will “catch up” within a year or two.

Then they appear to be indistinguishable from L1 acquirers of the language.

Adult L2 acquisition diverges in certain ways from L1 acquisition

Pronunciation

- pitʃ *vs.* pɪtʃ
- θɪŋk *vs.* sɪŋk

Inflectional morphology:

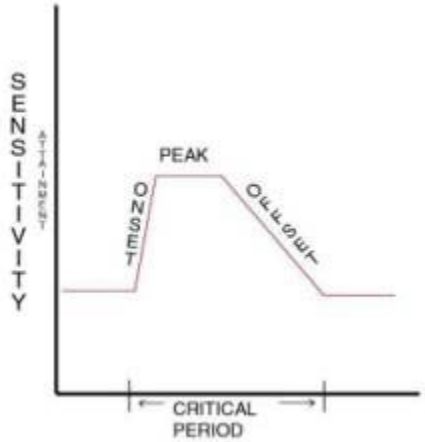
- *The students are intelligent**s**.

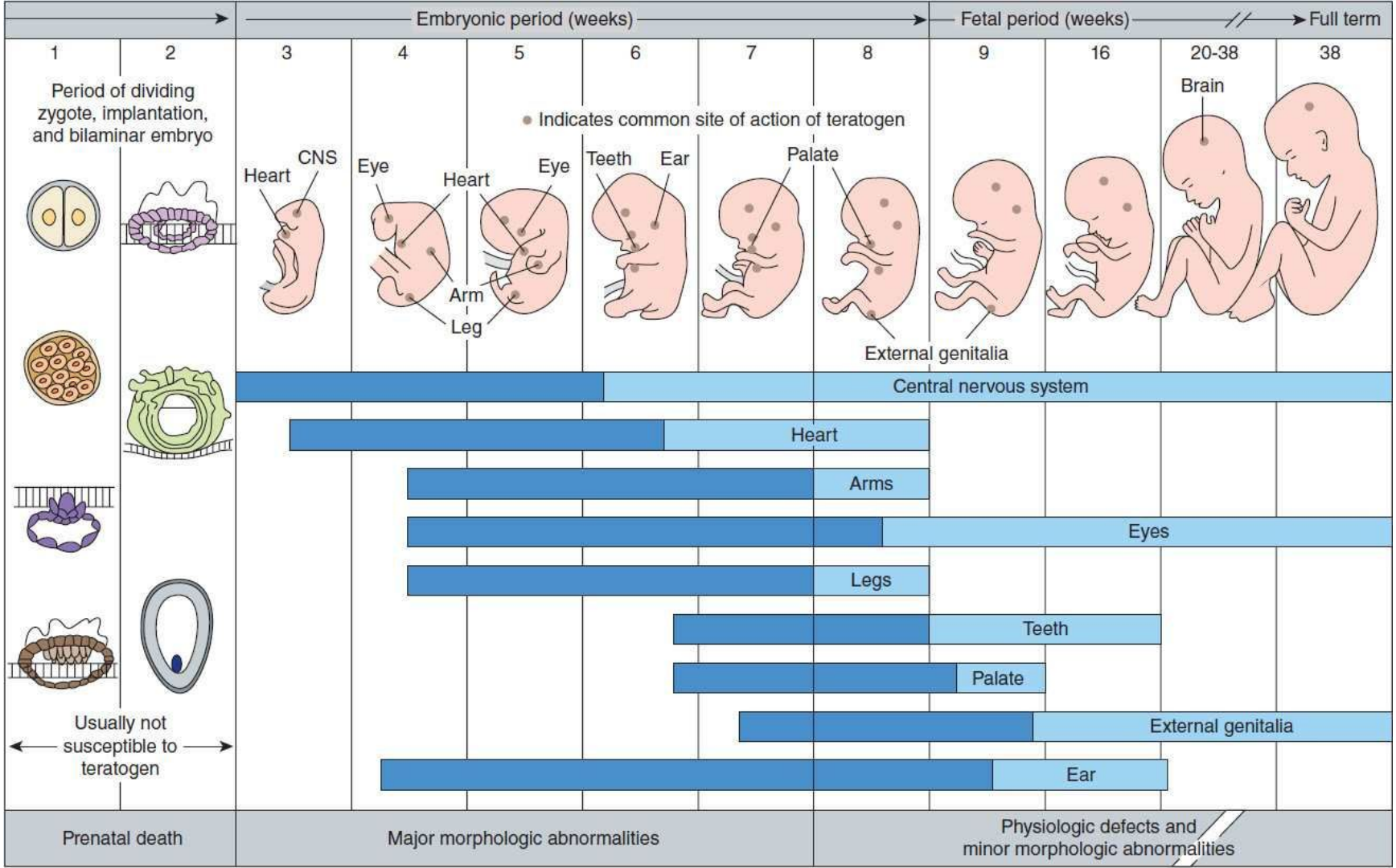
Subtle semantic distinctions not present in L1

- *I saw a snow. *vs.* I saw the snow. *vs.* I saw snow.
- “El niño corr**ía** mucho” *vs.* “El niño corr**ió** mucho”

Critical period for L1 acquisition

A **critical period** is defined by a limited window of opportunity during which a process can occur. Many kinds of developmental processes have critical periods.




Embryonic period (weeks)
Fetal period (weeks)
Full term
1
2
3
4
5
6
7
8
9
16
20-38
38
Period of dividing zygote, implantation, and bilaminar embryo
Indicates common site of action of teratogen
Heart
CNS
Eye
Heart
Eye
Teeth
Ear
Palate
Brain
Arm
Leg
External genitalia
Central nervous system
Heart
Arms
Eyes
Legs
Teeth
Palate
External genitalia
Ear
Usually not susceptible to teratogen
Prenatal death
Major morphologic abnormalities
Physiologic defects and minor morphologic abnormalities

Evidence for critical period in L1

Young infants are “universal listeners,” but the ability to discriminate sounds that aren’t used in their language declines after 10 months.

Delaying L1 acquisition until after childhood leads to low levels of grammatical development (e.g. Genie).

Evidence for critical period in L1 from late signers

Second Language Acquisition and the Critical Period

We know there is a critical period for L1 acquisition

What would a critical period for L2 acquisition look like?

Do we find evidence for such a critical period?

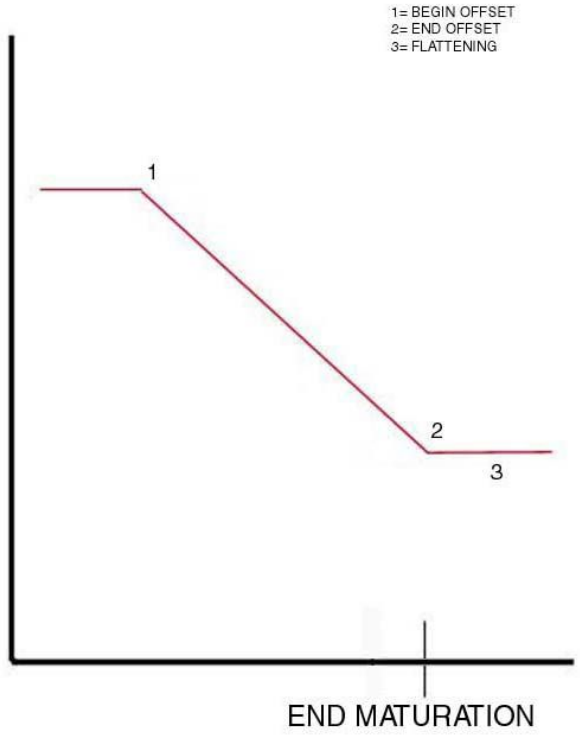
Do late learners ever attain nativelikeness?

What would a critical period look like for L2?

Temporal features:

1. Heightened sensitivity in early childhood
2. Sensitivity declines up until a specific point in time (e.g. when neurocognitive maturity is reached)
3. Consistent low sensitivity for the remainder of the lifespan

Additionally, we would expect the period to be consistent and pervasive across humans.



Jigsaw Discussion

Link to Chacon's article **here**.

Questions to discuss:

- To what extent do you agree or disagree with the author's main claim, given the evidence provided? (Main claim = the title of the article)
  - What kinds of evidence do you think would strengthen the author's claim?
  - What kinds of evidence do you think would strengthen the commonly misreported claim?
- How is comparing early and late L2 acquisition like comparing apples and oranges?
- Based on the evidence presented, do you think there is a critical period for L2 acquisition?
- How does debate over a critical period for L2 learning inform larger debates about nativism and empiricism?

Tentative conclusions

Is there a sharp cutoff point where sensitivity begins to decline?

Does sensitivity flatten out in adulthood for everyone?

Is there a significant change in sensitivity when maturation is reached?

Is there a well-defined critical period for L2 acquisition?

Does age affect L2 acquisition?

Tentative conclusions

Is there a sharp cutoff point where sensitivity begins to decline? **NO**

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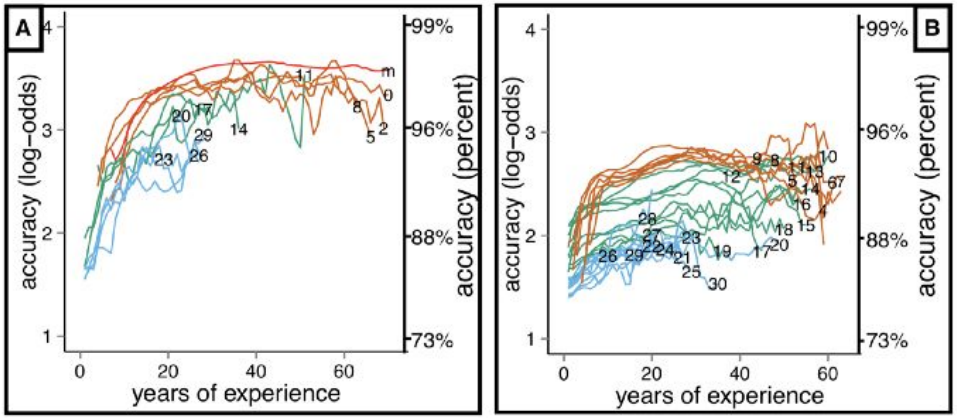

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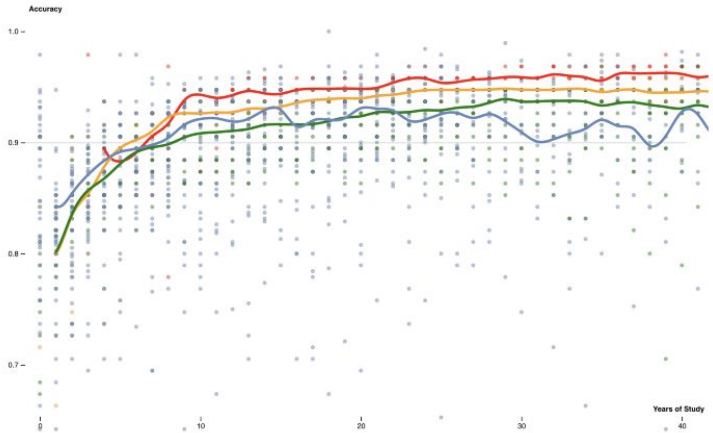

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Does age affect L2 acquisition?

Tentative conclusions

Is there a sharp cutoff point where sensitivity begins to decline? **NO**

Does sensitivity flatten out in adulthood for everyone? **NO**

Is there a significant change in sensitivity when maturation is reached? **NO**

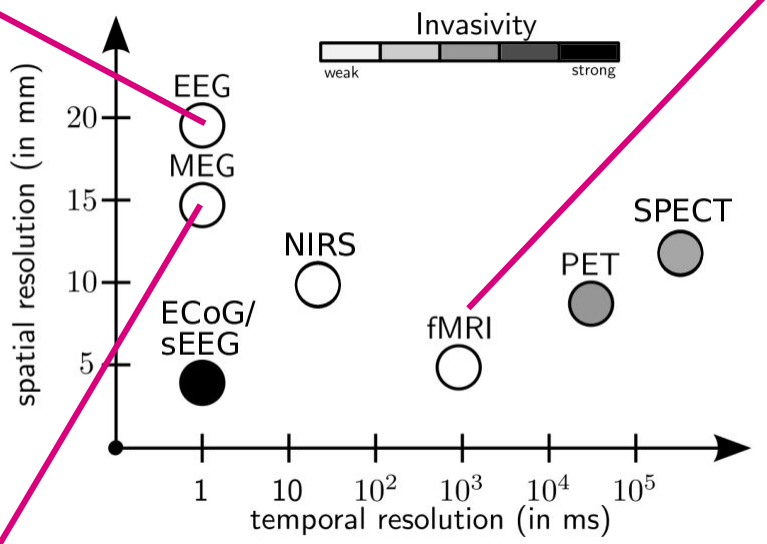
Is there a well-defined critical period for L2 acquisition? **NO**

Does age affect L2 acquisition? **YES**

Break

How is the brain involved in language?

Some tools we can use to investigate

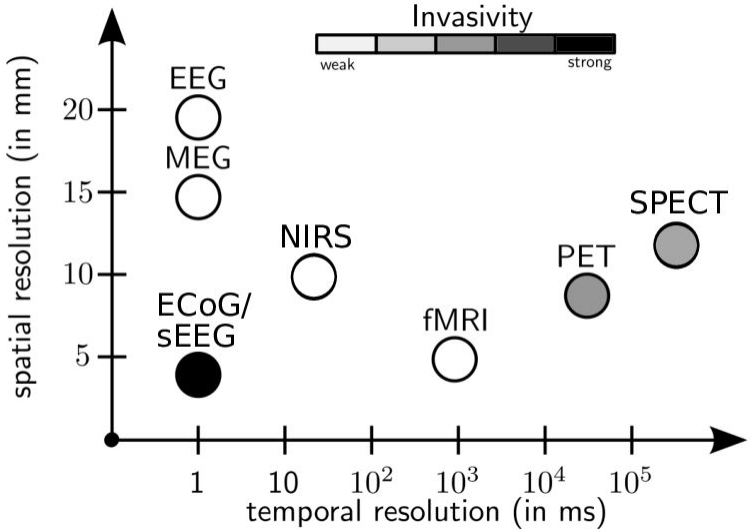


Some tools we can use to investigate

EEG: measures electrical fields

fMRI: measures metabolic activity = blood oxygen

MEG: measures magnetic fields



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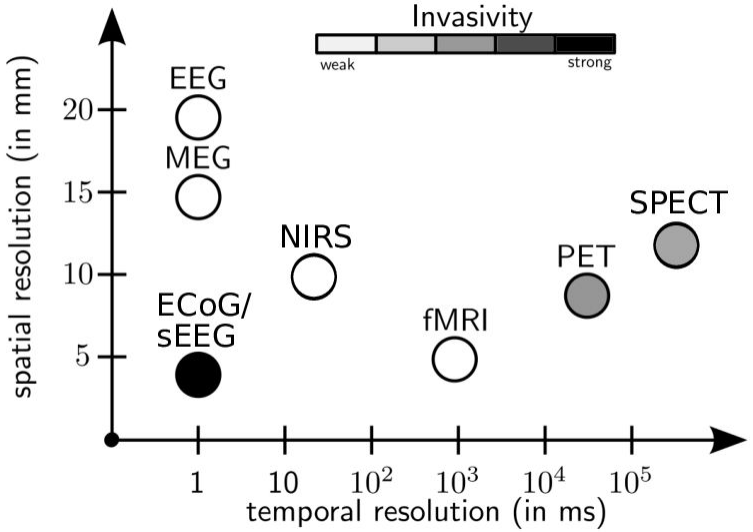
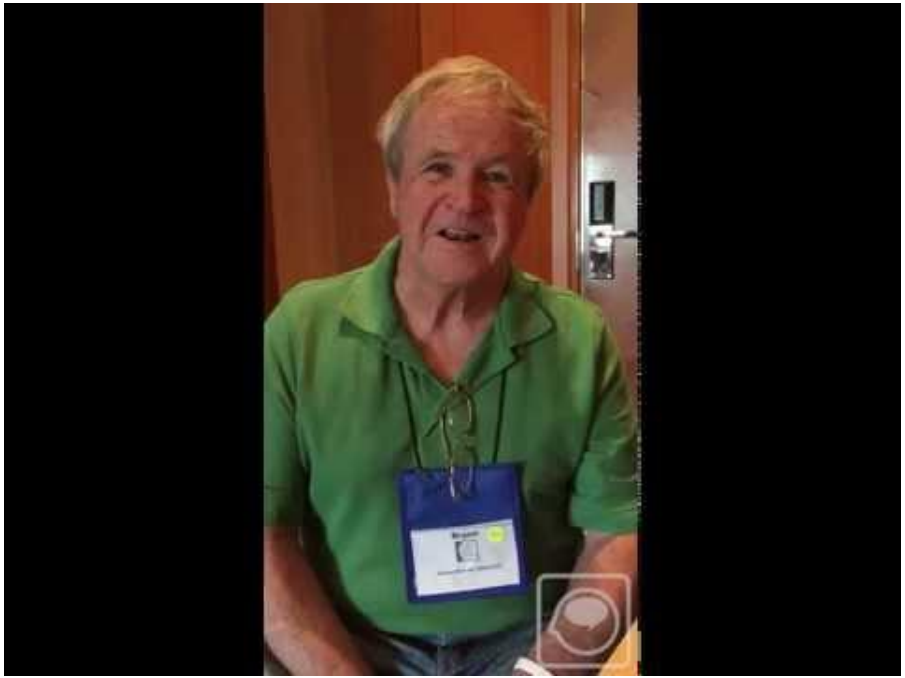


Better **spatial resolution** means you can better answer **"Where?"** questions.

Better **temporal resolution** means you can better answer **"How?"** questions.

Receptive Aphasia



Frequently called **Wernicke's Aphasia**

Defining Characteristics:

- Fluent speech
- Impaired comprehension
- Lack of awareness of their deficits

What do we learn about language and the brain from the existence of Receptive Aphasia?

Note: This person's aphasia is the result of a **stroke**, a loss of blood flow to a particular area of the brain, resulting in cell death.

Expressive Aphasia

Frequently called **Broca's Aphasia**

Defining Characteristics:

- Non-fluent speech
- Intact comprehension
- Fully aware of their deficits

What do we learn about language and the brain from the existence of Expressive Aphasia?

Note: This person's aphasia is the result of a **stroke**, a loss of blood flow to a particular area of the brain, resulting in cell death.

Towards a Neurobiological Model of Language

Broca's Area

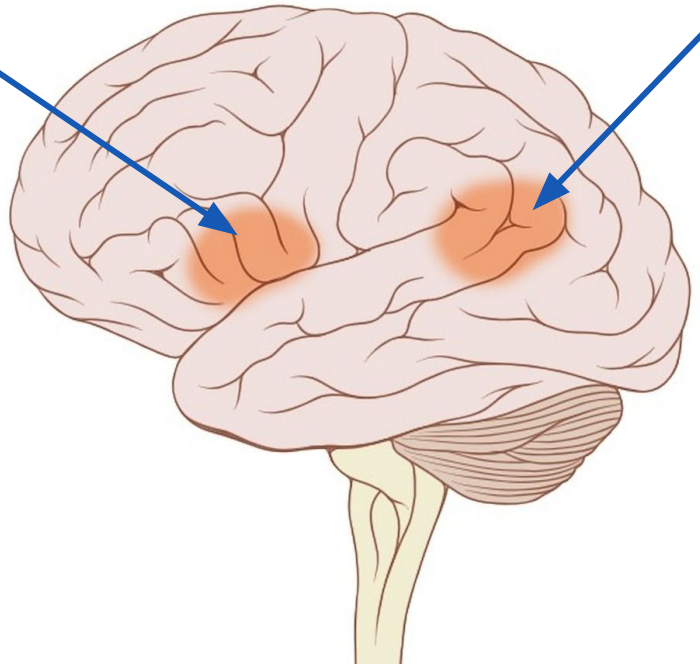
(Brodmann 44 & 45)

Located in the dominant hemisphere (usually the left)

We used to think it was most important for speech production (see Broca's aphasics)

Now we also recognize that it is important for comprehension

It's important for translating between sequential and hierarchical language structure



Wernicke's Area

(Brodmann 22)

Located in the dominant hemisphere (usually the left)

We think this area is important for speech comprehension (see Wernicke's aphasics)

Translating sounds into meaningful units (phonemes, morphemes, and words) seems to happen in this area.

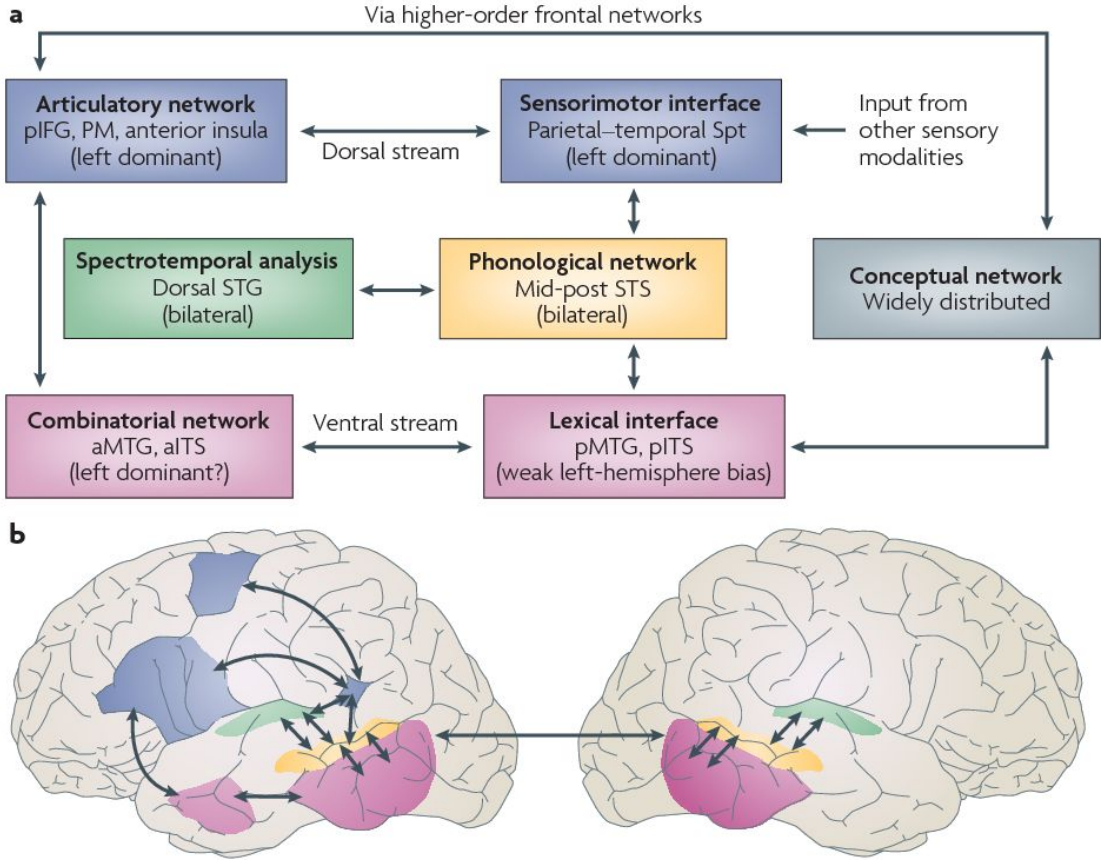
Dual Stream Model (Hickok & Poeppel 2007)

Current dominant model of language production / perception.

Ventral Stream: Maps auditory information onto concepts

Dorsal Stream: Maps auditory information onto articulators

Note: Broca and Wernicke's areas are still in the mix, but differently



Review

1. Why do children start out learning both regular and irregular morphology so well?

2. If my child says “mama” at 6 mo., is their language development early, on-time, or late? What information would help make a better diagnosis?

3. How do we know that there is a critical period for L1 acquisition?

4. If I want to know what area of the brain processes the difference between grammatical sentences and ungrammatical sentences, what imaging technique should I use and why?

Coming Up...

Midterm due on Tuesday

- If you have questions:
  - come to my office hours on Friday or Monday
  - email me

Final project posted (due before the final-- in 2.5 weeks)

Extra Slides about the History of the Critical Period Hypothesis for SLA

Do we actually find a critical period for SLA?

The “classic” study says yes...

Johnson & Newport (1989) compared English proficiency of Korean and Chinese immigrants to the US.

- Age of arrival ranged from 3 to 39
- Length of residence in the US was at least 3 years
- Subjects were tested on a variety of English structures

Johnson & Newport (1989) Results

Clear and strong advantage for early arrivals over late arrivals.

Age of arrival before puberty (15yrs)

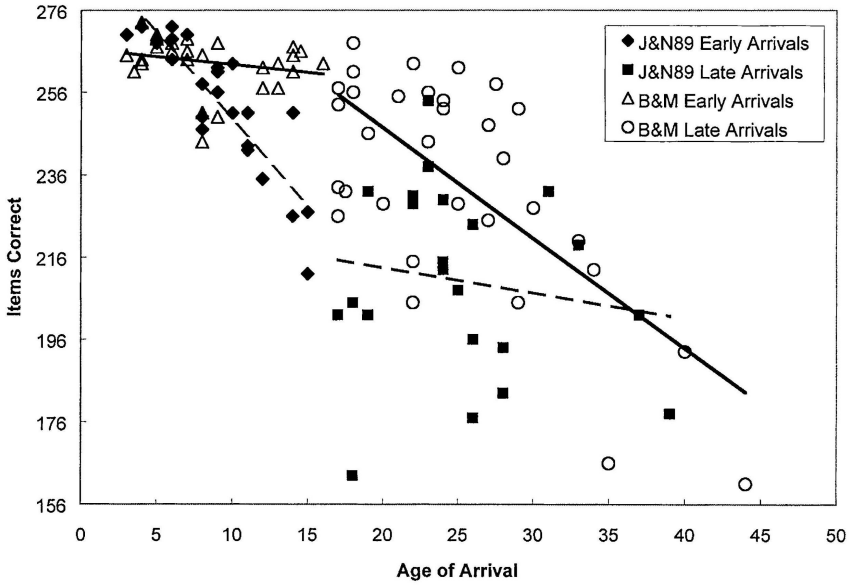
- Performance linearly related to age

Age of arrival after puberty

- Performance low but highly variable
- Performance unrelated to age

But...

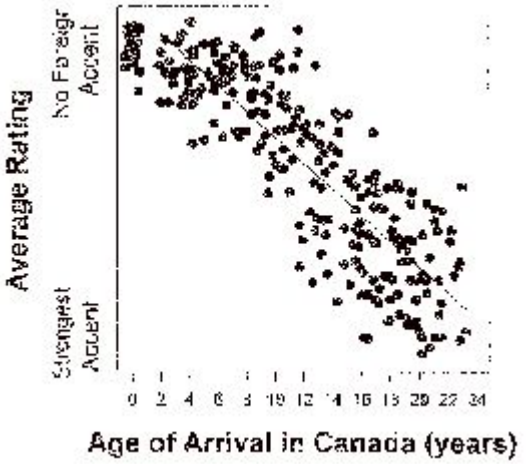
Birdsong & Molis (2001) got different results:



Flege (1999)

Pronunciation of Italian immigrants to Ontario, Canada

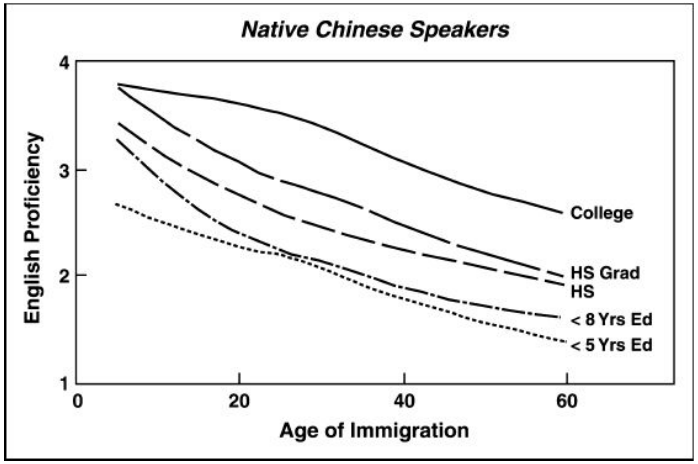
- Length of residence >15 years
- No cutoff point where decline begins
- No flattening out in adulthood

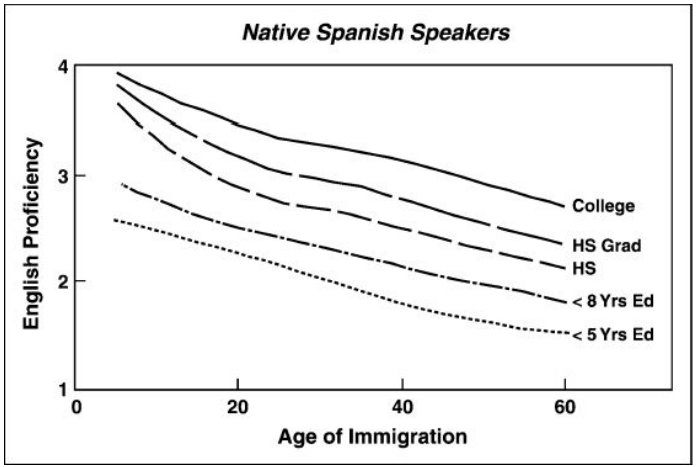


Hakuta, Bialystok, & Wiley (2003)

Self-assessed oral proficiency ratings of Chinese- and Spanish-speaking immigrants to the US (1990 census)

- Length of residence >10 years
- 2.3 million responses
- No cutoff where decline begins
- No flattening out in adulthood





Hakuta, Bialystok, & Wiley (2003) Conclusions

“Our conclusion… is that second-language proficiency does in fact decline with increasing age of initial exposure.”

“The pattern of decline, however, failed to produce the discontinuity that is the essential hallmark of a critical period.”

“The degree of success in second-language acquisition steadily declines throughout the life span.”

Do late learners ever attain nativelikeness?

- Previously assumed answer: Very rarely
  - This is what we would expect if there is a critical period

- But in work since the late 90s, we find that incidence of nativelikeness occurs from 5-20%
  - This is additional evidence against the existence of a critical period for L2 acquisition.

Comments on nativelikeness

- Not monolithic: one can be nativelike in pronunciation, but not in syntax (or vice-versa)

- Comparing apples to oranges: need to consider age of exposure as well as number of years of exposure

Why do L2 learning ability and outcomes decline throughout life?

- Biology:
  - Age-related changes in cognitive processing
  - For example, decreasing ability to:
    - Learn paired associates
    - Encode new information
    - Recall detail as opposed to gist
    - Perform “control” processes (e.g. Simon task)
  - ALSO, general decline in:
    - Working memory
    - Cognitive processing speed
    - Attention

Why do L2 learning ability and outcomes decline throughout life?

- Environment:
  - Lack of input that is good for learning
  - Insufficient time