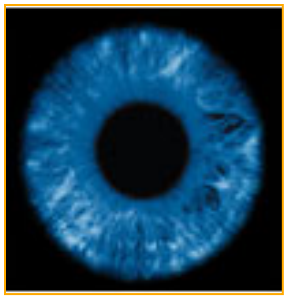

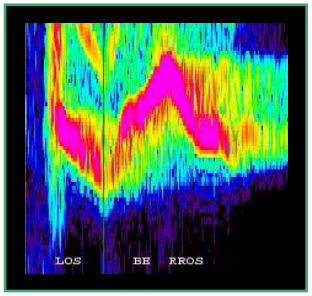


Sign Languages and Bilingualism: Scientific Developments and Emerging Opportunities

David P. Corina Ph.D.

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Departments of Linguistics and Psychology
University of California. Davis

VL2 VISUAL LANGUAGE & VISUAL LEARNING

National Science Foundation

NIDCD National Institute on Deafness and Other Communication Disorders
Improving the lives of people who have communication disorders

Overview

- Signed Language
- Brain processing of signed language
- Bilingualism

Human Language

- Unique ability
- All humans learn language
- Effortless and natural
- Surprisingly quick !
- Studying language provide a means to understand what it is be human.

A limitation of current language research

- Emphasis on of spoken language
- Must also include the study of signed languages

What are Signed Languages ?

Sign languages are natural languages.

- Not “invented” languages

Sign language is not universal.

- There are many distinct sign languages

Strobe photograph of ASL signs "join" and "inform." (Reprinted by permis-

Sign Languages

- Human language
  - Expressed with hands/body perceived through eye
- Fully linguistically complex
  - Able to covey same information as a spoken language
- Operating on same Universal Grammar as spoken languages
- **There are many different signed languages**

ASL, BSL, HKSL etc.

- http://youtu.be/y0RbTCOUxSk
- http://youtu.be/GNJLBQizHAw

Signed Languages are not based on spoken languages

Sampling of documented Sign Languages

http://www.ethnologue.com/

Wht are there so many signed languages ?

- ASL the same question of spoken language
- Where did they come from?
- Signed languages arise in small communities of deaf (and hearing) persons.
- Al-Sayyid Bedouin Sign Language

Al-Sayyid Bedouin Sign Language

- The spontaneous emergence of the language in the last 70 years, which has developed a complex grammar in near-isolation.

- Of particular interest to linguists for the insights it provides into the birth of human language.

- https://www.youtube.com/watch?v=8DzrkopgLfU

Humans are ready to learn language… **any language**

- Babies are able to learn any accessible language.
- Babies are citizens of the world.
- But soon narrow their preferences to their language community
- They show a preference for **language** over other complex sounds and gestures.

Perceptual Narrowing

마더

牛奶 حليب dog بابا

mommy 狗

padre

6 months

마더

牛奶 حليب dog بابا

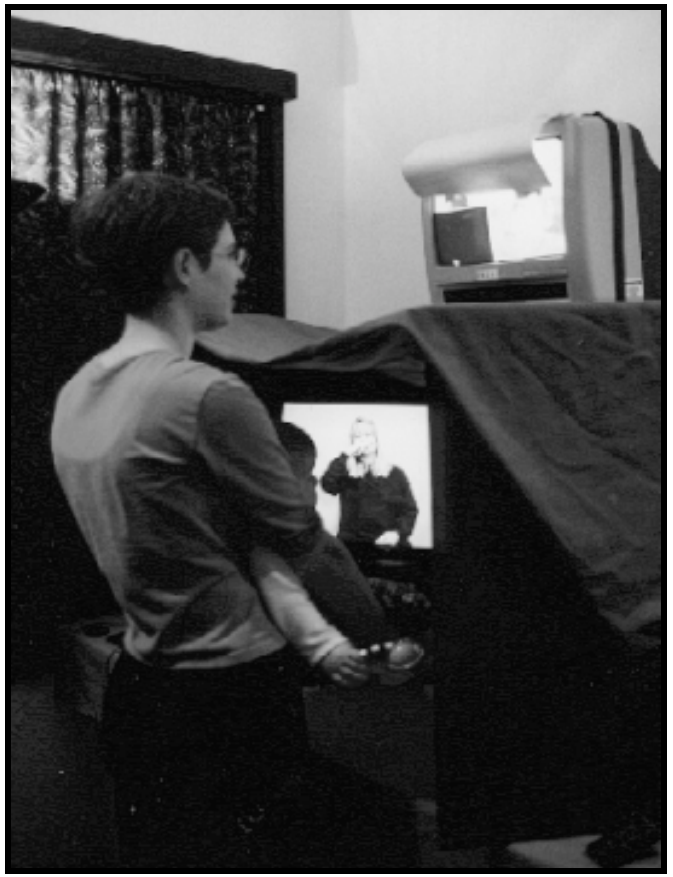
mommy 狗

padre

10 months

Perceptual Narrowing for Natural Signed Languages

Experimental set-up



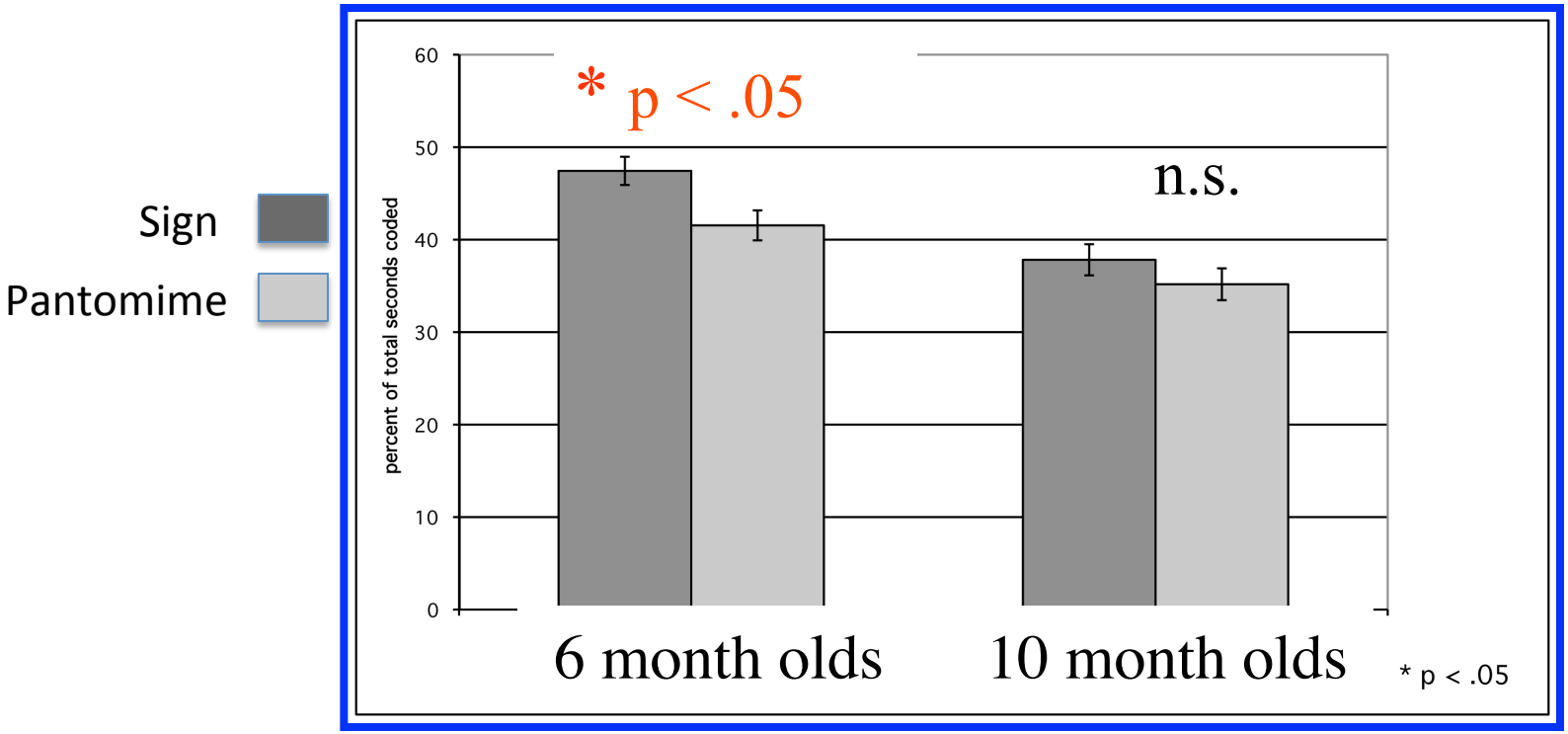
Preferential looking paradigm
Sign Language versus Gesture

Hildebrandt & Corina (2007)

Preferential looking paradigm

Hildebrandt & Corina (2007) Dev. Science

Looking times for sign language and gestures in hearing 6 and 10-month-olds



- 6 month olds look significantly longer at the ASL
- 10 month olds do not show a preference.

Hildebrandt & Corina (2007) Dev. Science

Perceptual Narrowing for Natural Signed Languages

- Babies ready to learn a natural sign language
- Show a preference for natural signed languages over gesture
- They begin to lose this sensitivity if ASL is not the language of their community
- But could maintain this interest if exposed to a language

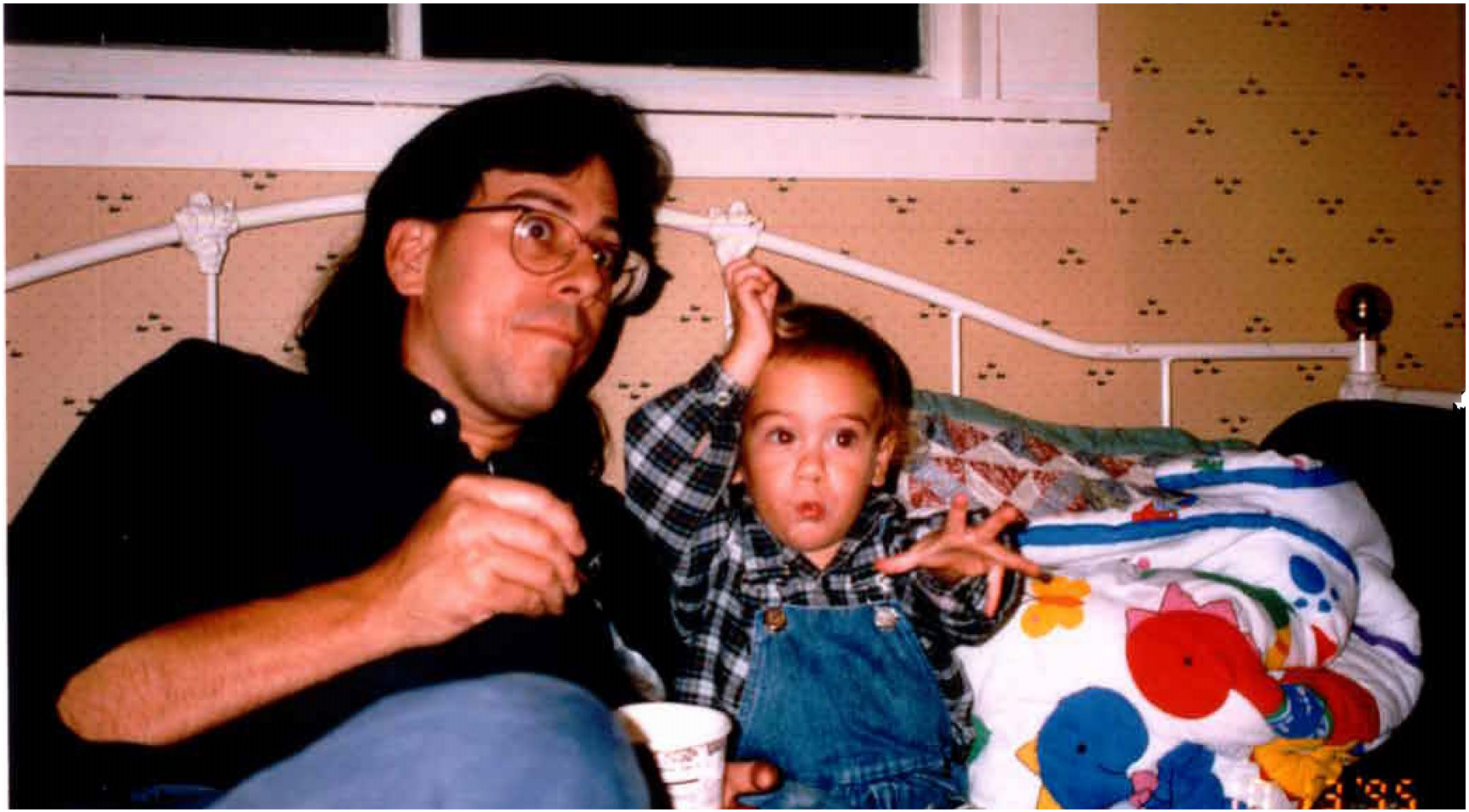
We can teach babies signed languages

- Our brains are ready to receive signed languages.

- Our brains enable babised to learn and use a signed language in the same way as a spoke language.

- Benefits of knowing more that one language

My son 9 months olds

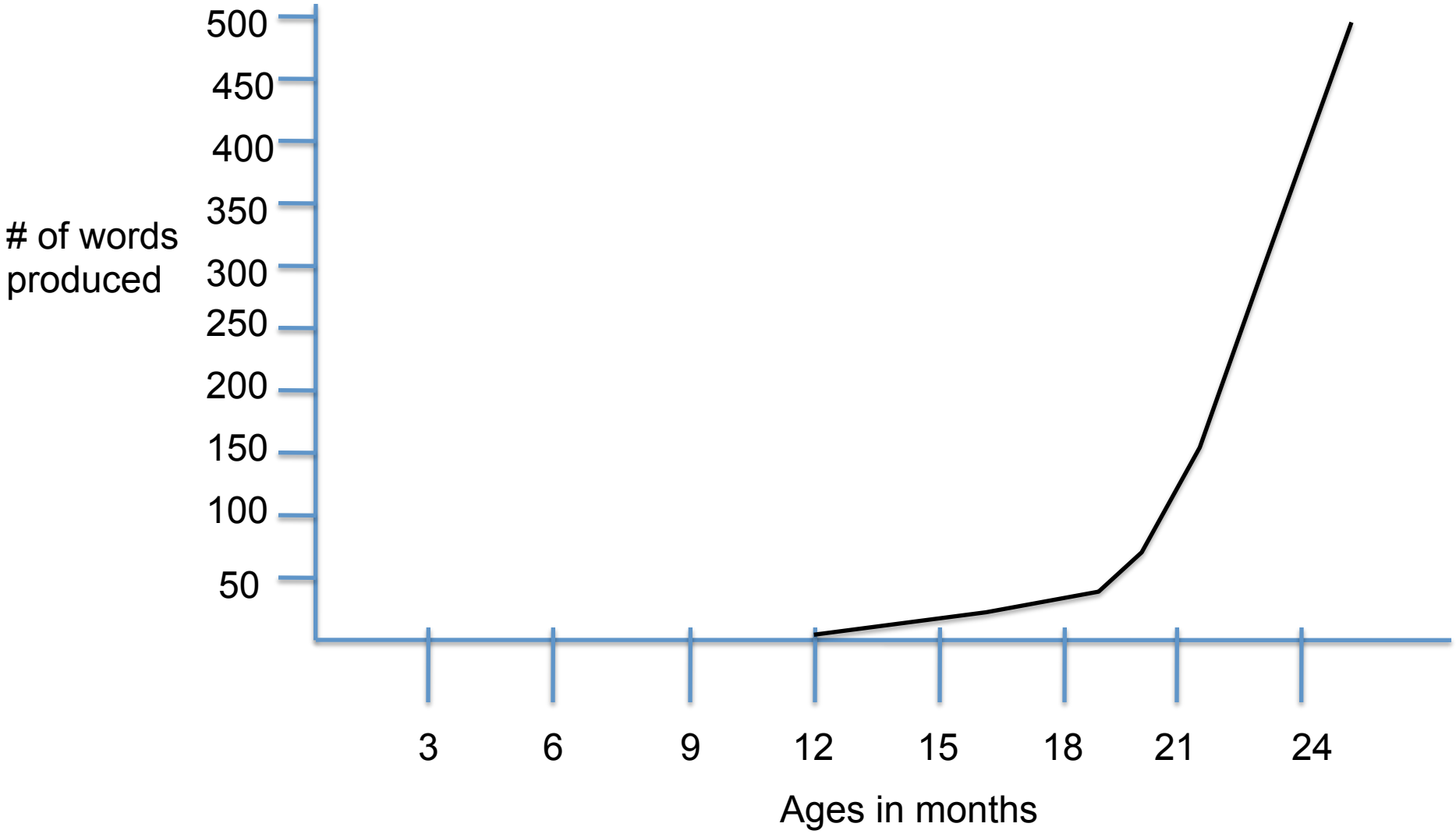


Watching “The Lion King”

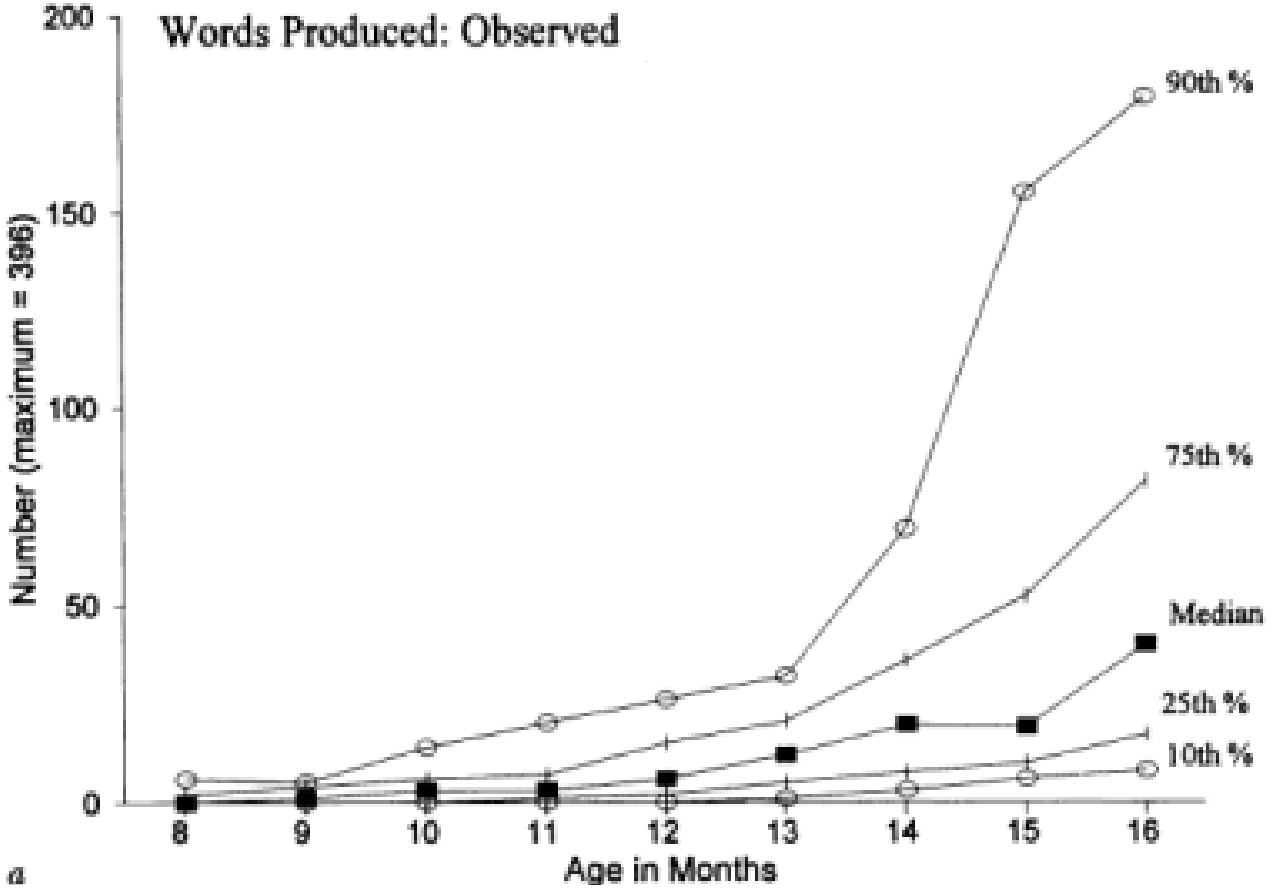
Language Development

- 0-2 vegetative noises
- 2-4 months social smiles cooing
- 4-6 months reduplicative babbling
- 7-12 months variegate babbling, intonational contours
- 8-10 months communicative gestures
- 12 months, first words and first signs
- 18-20 months vocabulary burst ***
- 24-36 months multiword utterances

Idealized Vocabulary Burst



Vocabulary Burst (8-16 mo.) (real data)



Wow !

- Language acquisition is miraculous !

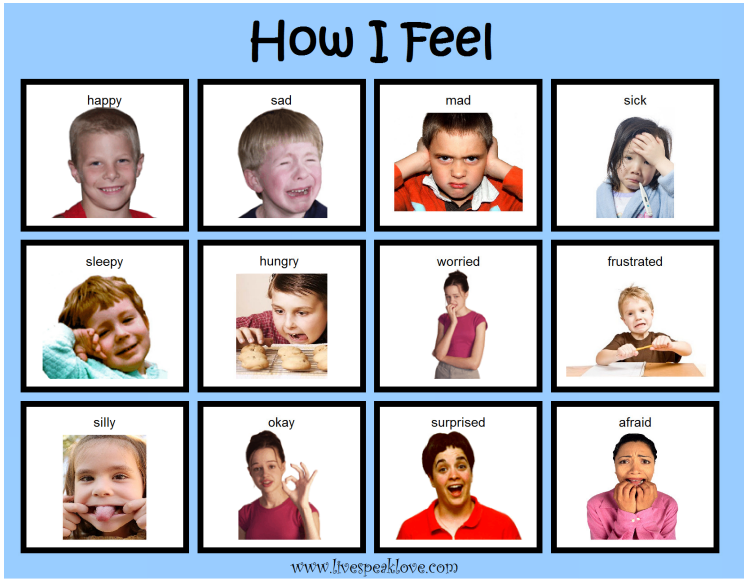
Signed Language Acquisition

- 4-6 months babbling
- 7-12 months manual babbling
- 8-12 months
  - Communicative Gestures and first signs earlier than speech ?
- 18 months
  - Two sign utterances

- Baby-talk
  - Speech: “ba-ba” “bottle”
  - ASL: MA-MA MOTHER
  - We see these simplification and “errors” in all natural languages
  - Spoken or signed

Importance of Early Language

- Mother–Infant Bonding



- Social-emotional development

Decasper & Fife 1980
Ainsworth, 1989
Calderon & Greenberg 2003

Early Language

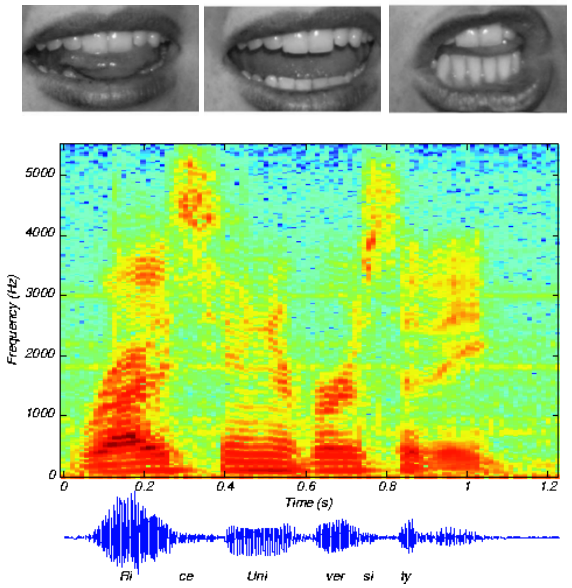
- Cognitive Development
- Memory
- Executive Function

Pisoni et al 2010

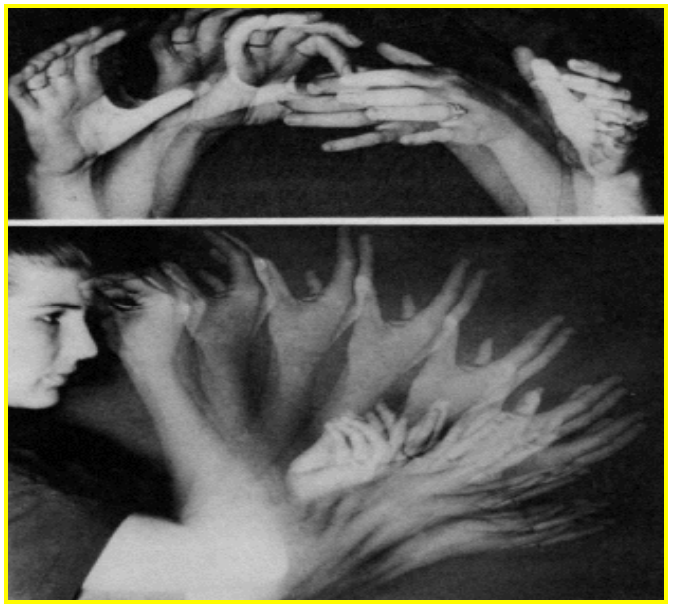
Early Language

- Reading.

Human Language



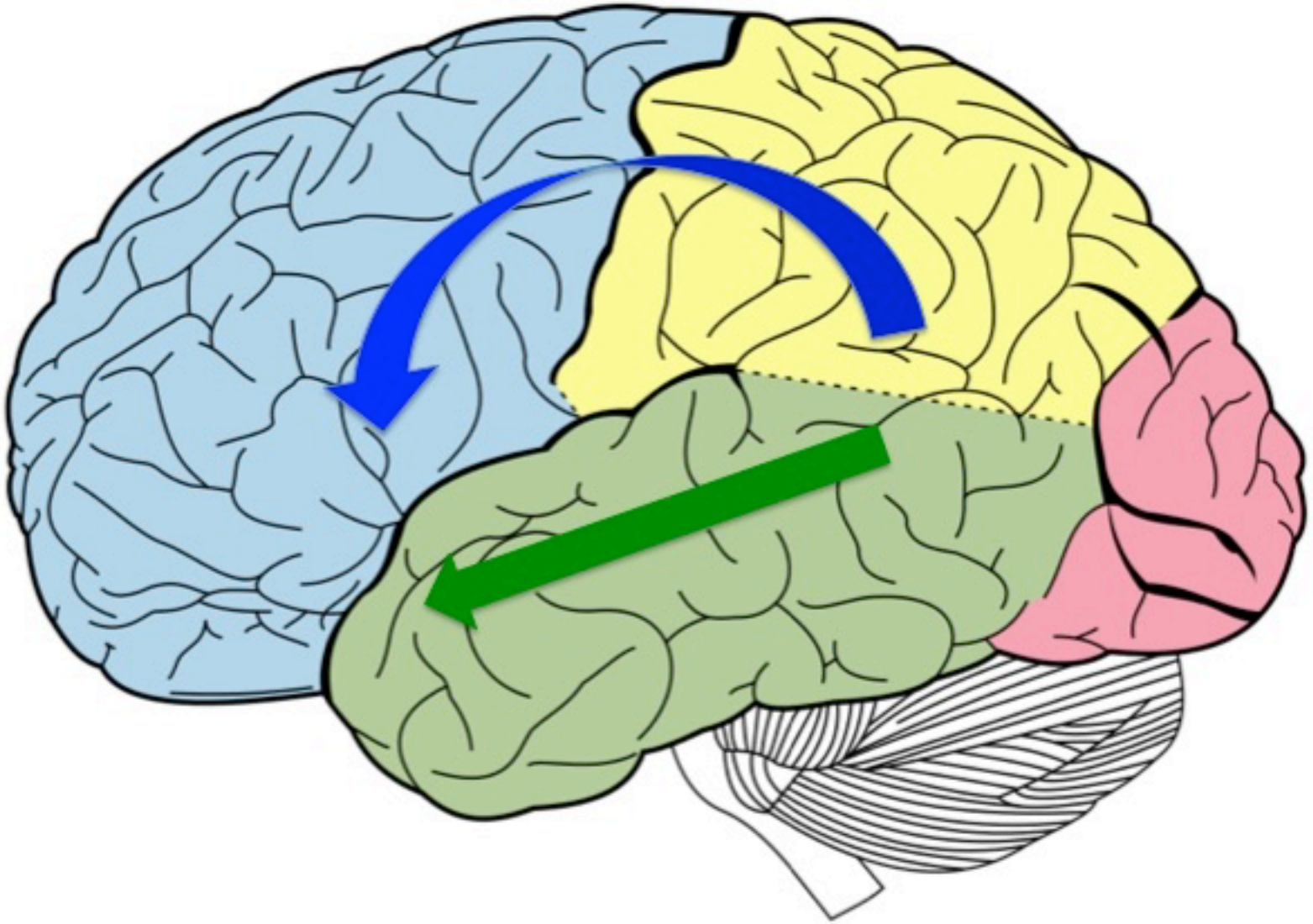
Spoken Languages



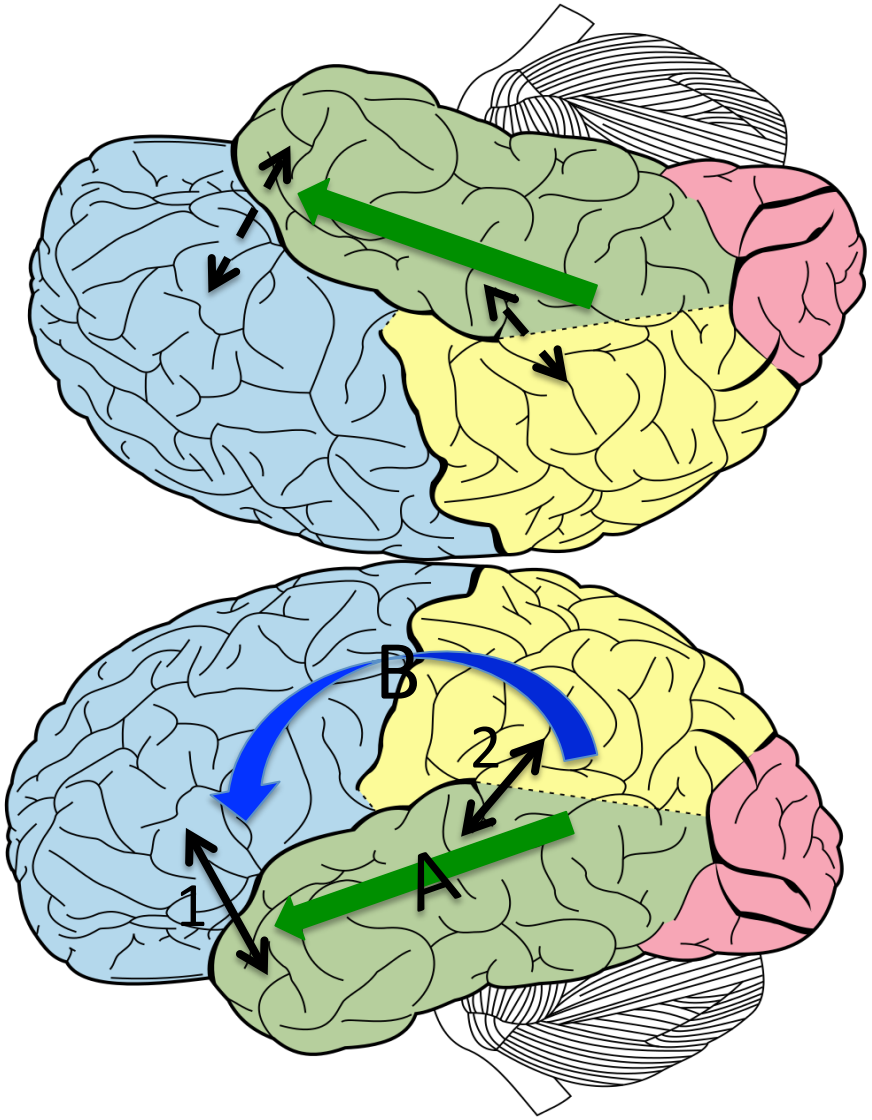
Signed Languages

Human languages does not have to be speech

Brain circuits for language



Right Hemisphere



Left Hemisphere

Neural Plasticity

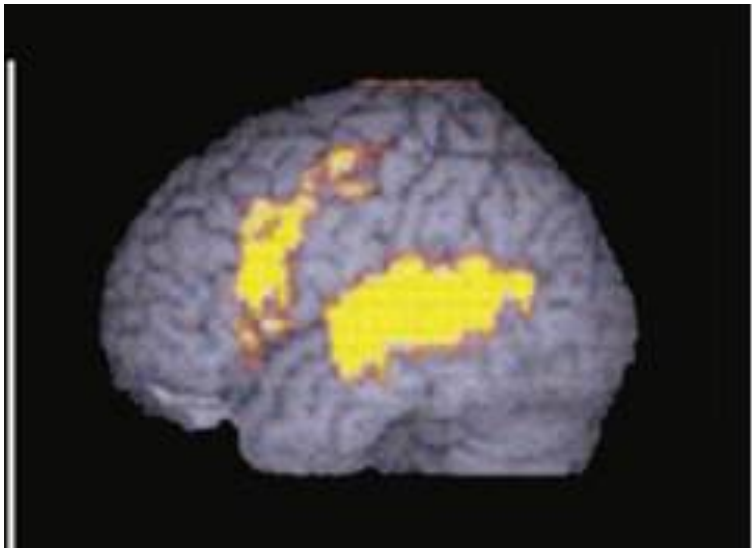
- The ability of the brain to develop and change connectivity.
  - Biological factors
  - Environmental factors

- Anatomical changes:
  - Synaptogenesis/Pruning
- Functional changes:
  - Triggering and stabilization

Left Hemisphere

Hearing Speakers

Subjects watching a speaker of English

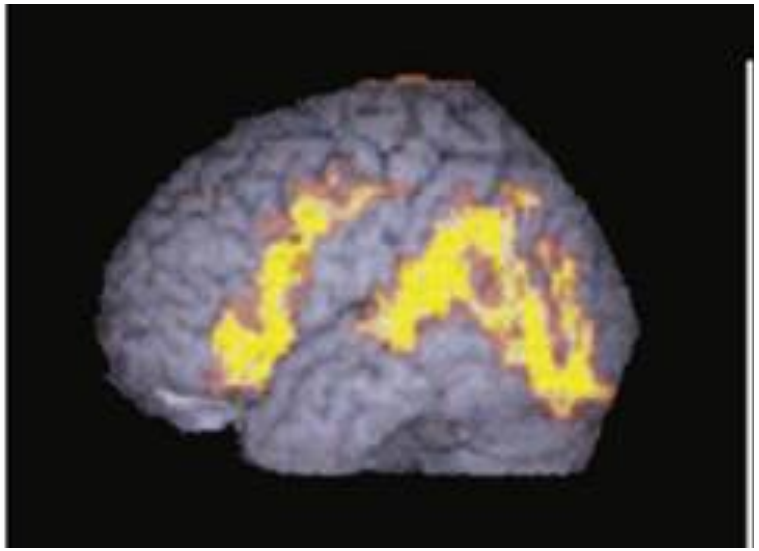


Spoken Language

(MacSweeney et al 2010)

Left Hemisphere

Deaf Signers



Sign Language

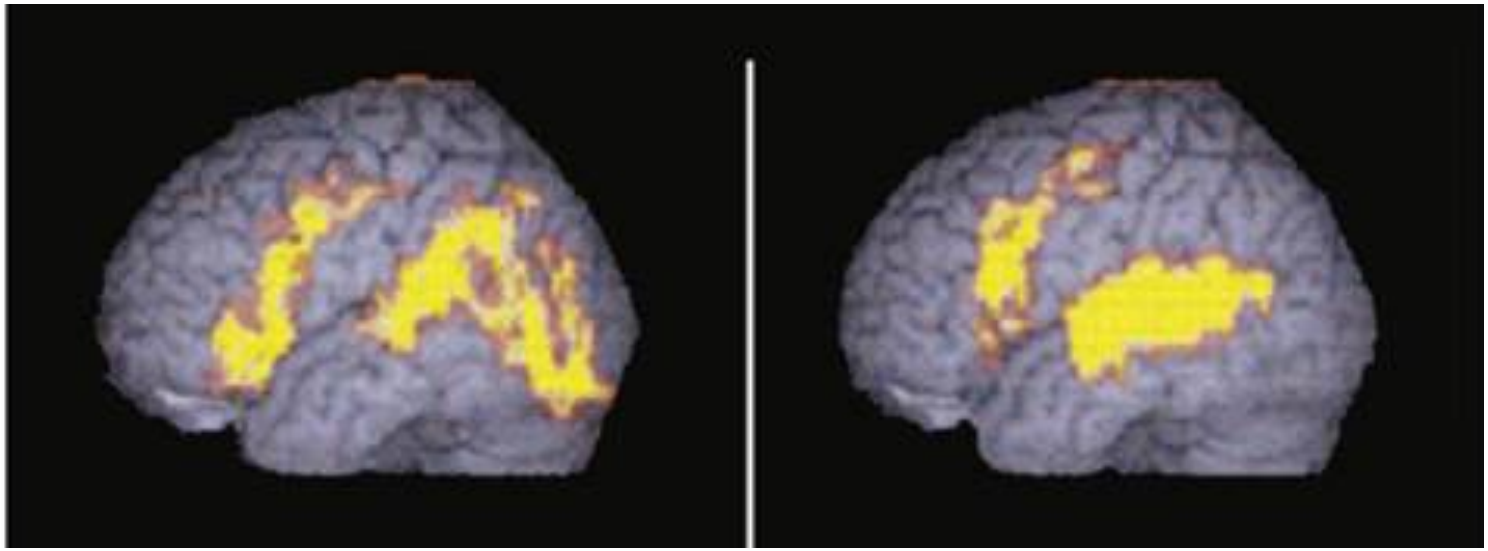
Subjects watching a signer of BSL

(MacSweeney et al 2010)

Left Hemisphere

Deaf Signers

Hearing Speakers



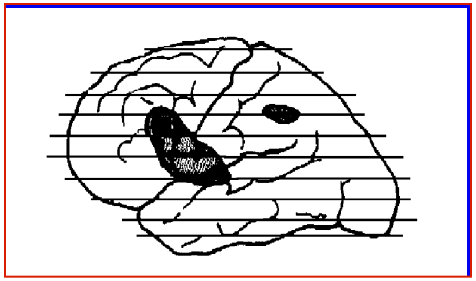
Sign Language

Spoken Language

Remarkable similarity !

(MacSweeney et al 2010)

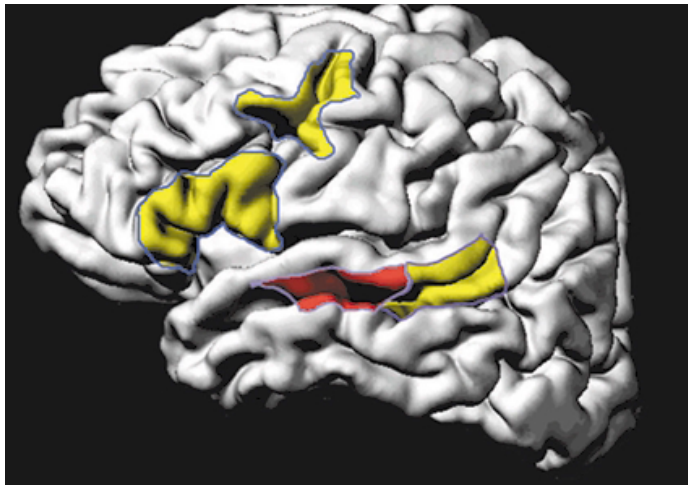
Effects of Left Hemisphere Damage



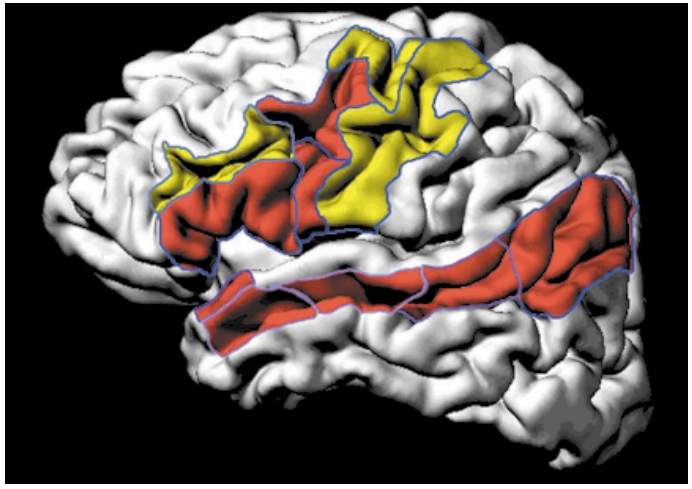
- 76 yr Male, CVA
- Lesion:
  - Left hemisphere lesion
- Globally Aphasic
  - language production and comprehension
- Sign Paraphasia

Corina, D. P. et. al (1992).. Brain and Language, 43, 414-447.

Hearing English-ASL Bilinguals



Written English

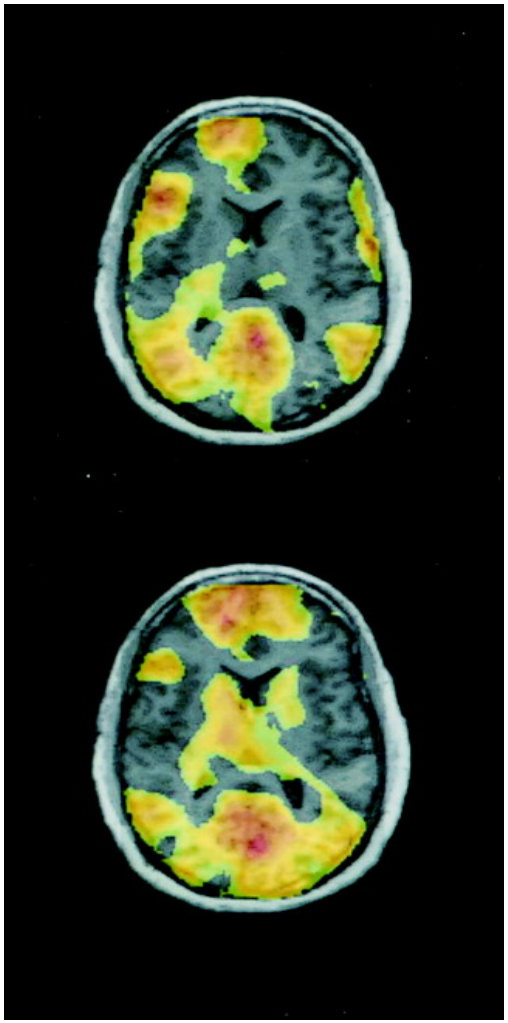


American Sign Language

Bimodal Bilinguals

ASL

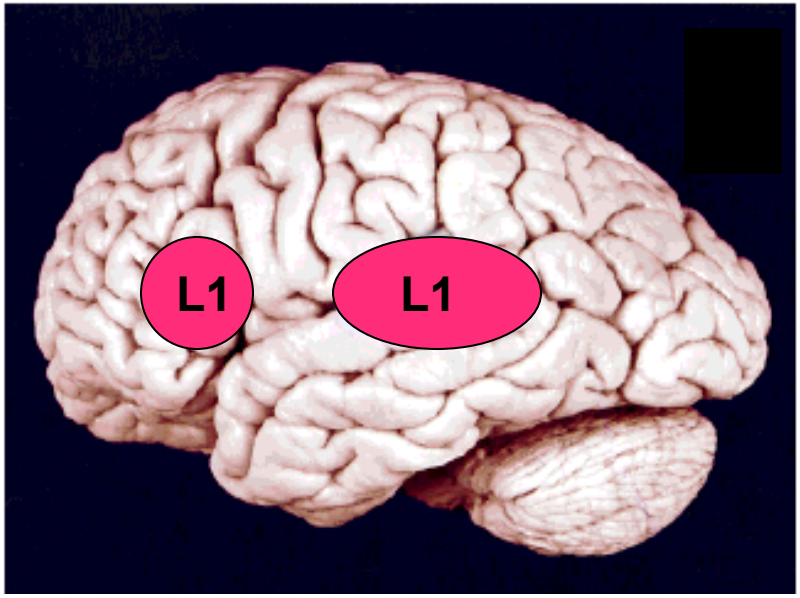
English

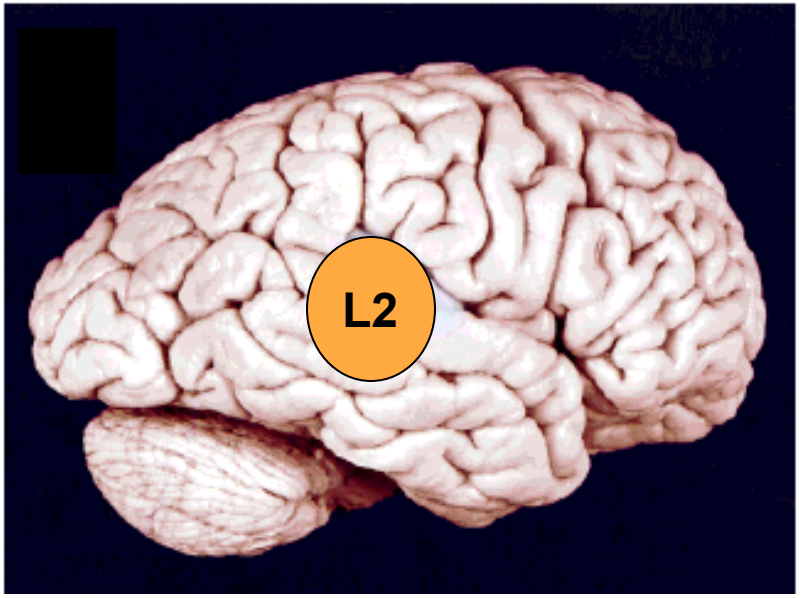


Discourse Production

Braun et al (2001)

Neural Representation of L1 L2 ?

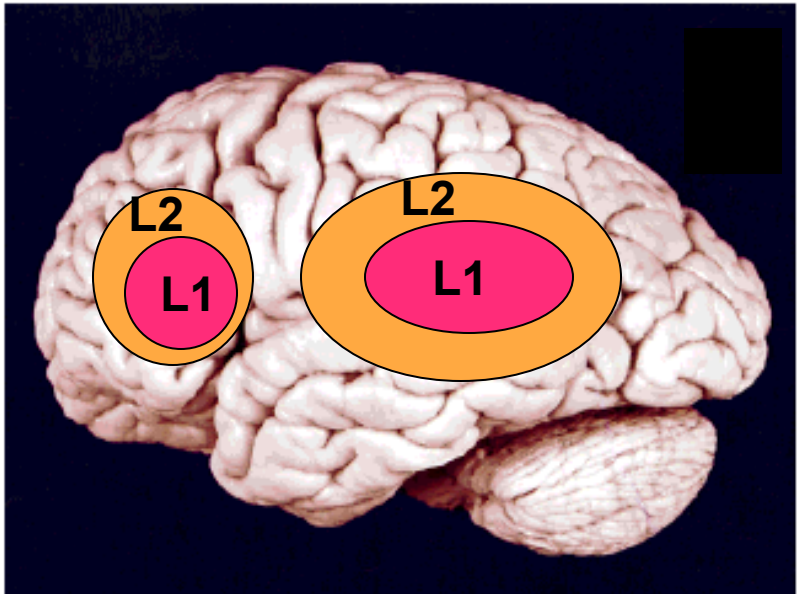


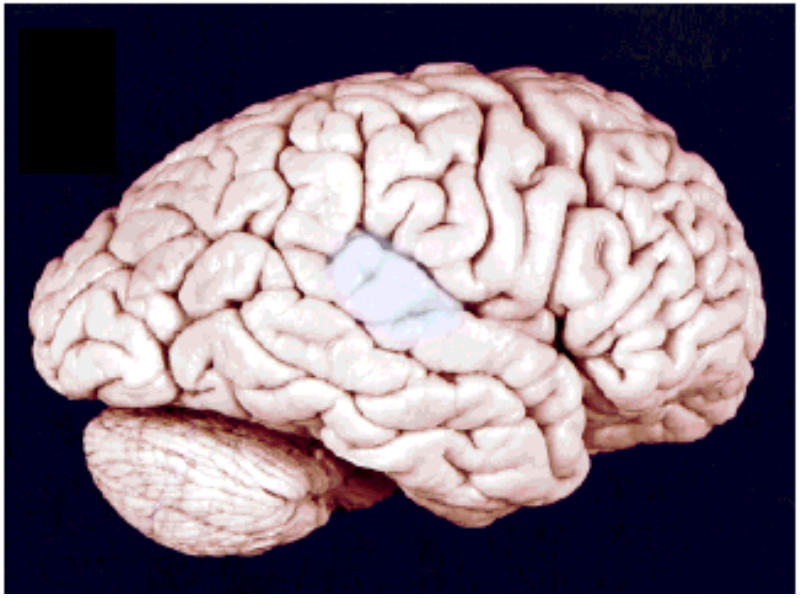


Early theories suggested hemispheric differences

Note bilingual aphasic evidence suggested some bilinguals did show dissociations

Neural Representation of L1 L2 ?

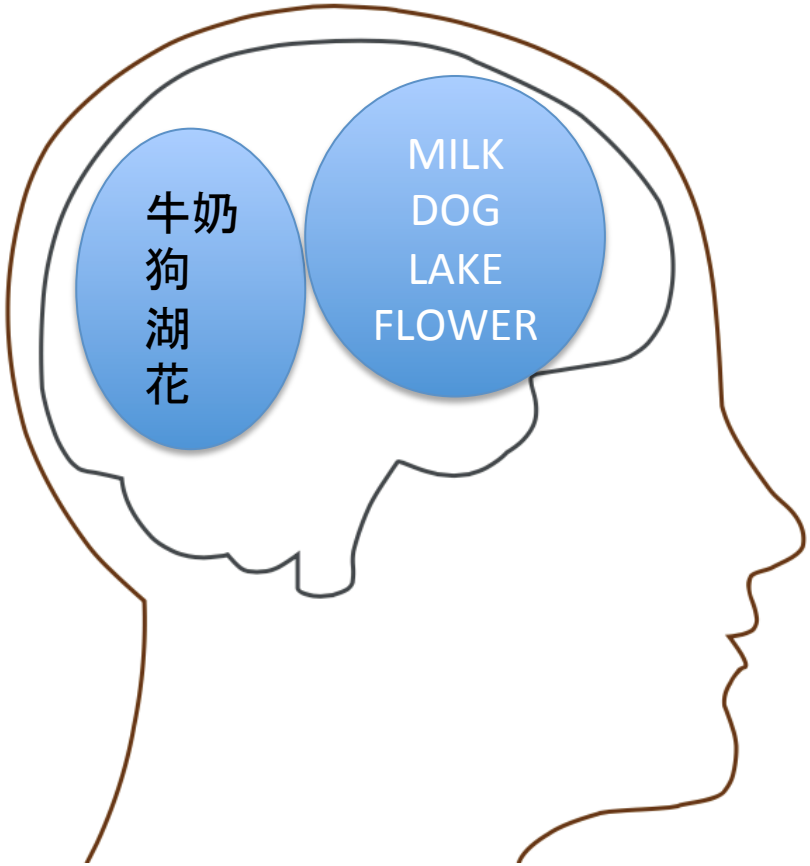




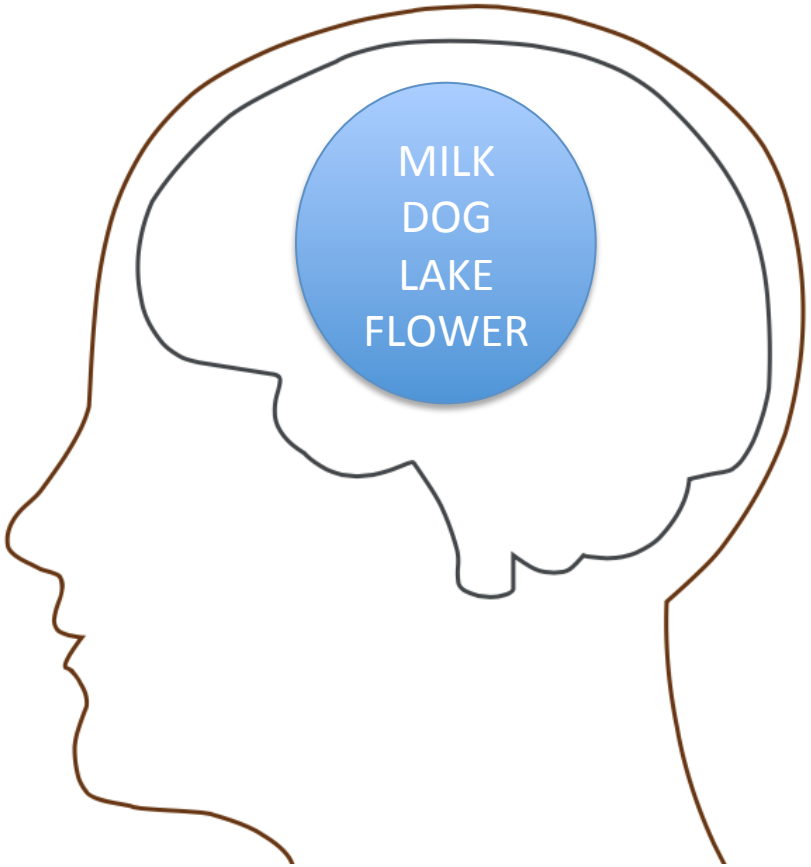
Recent neuroimaging suggest generally overlapping regions
With greater spatial extent for the less proficient language.

More neural resources needed for “harder work”

Wrong Picture

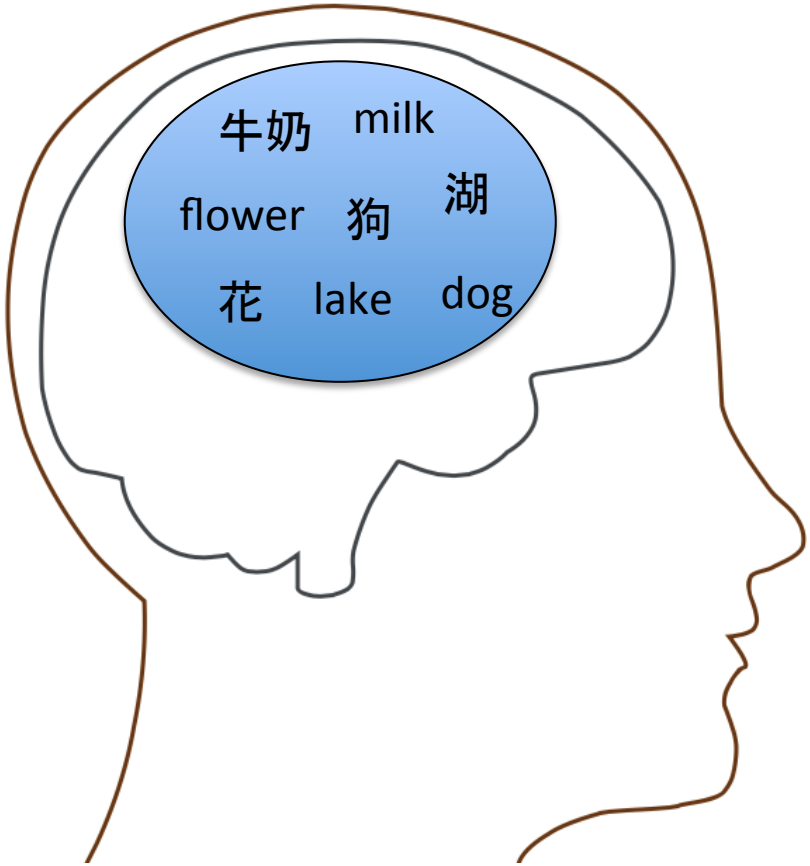


Bilingual
Two languages separate

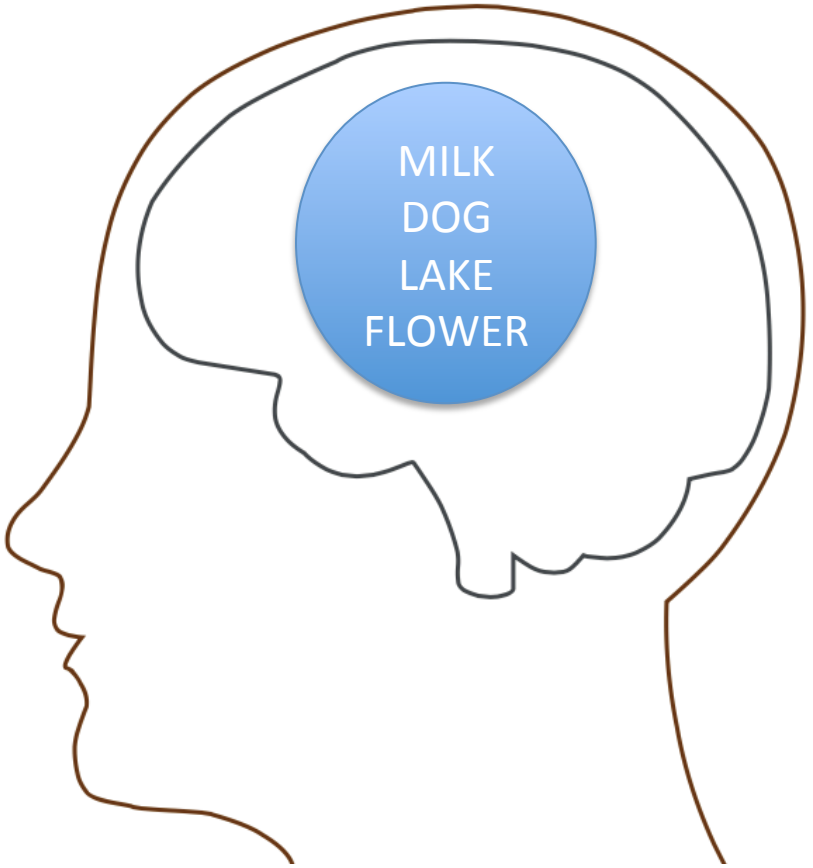


Monolingual

Correct View



Bilingual
Languages intermixed

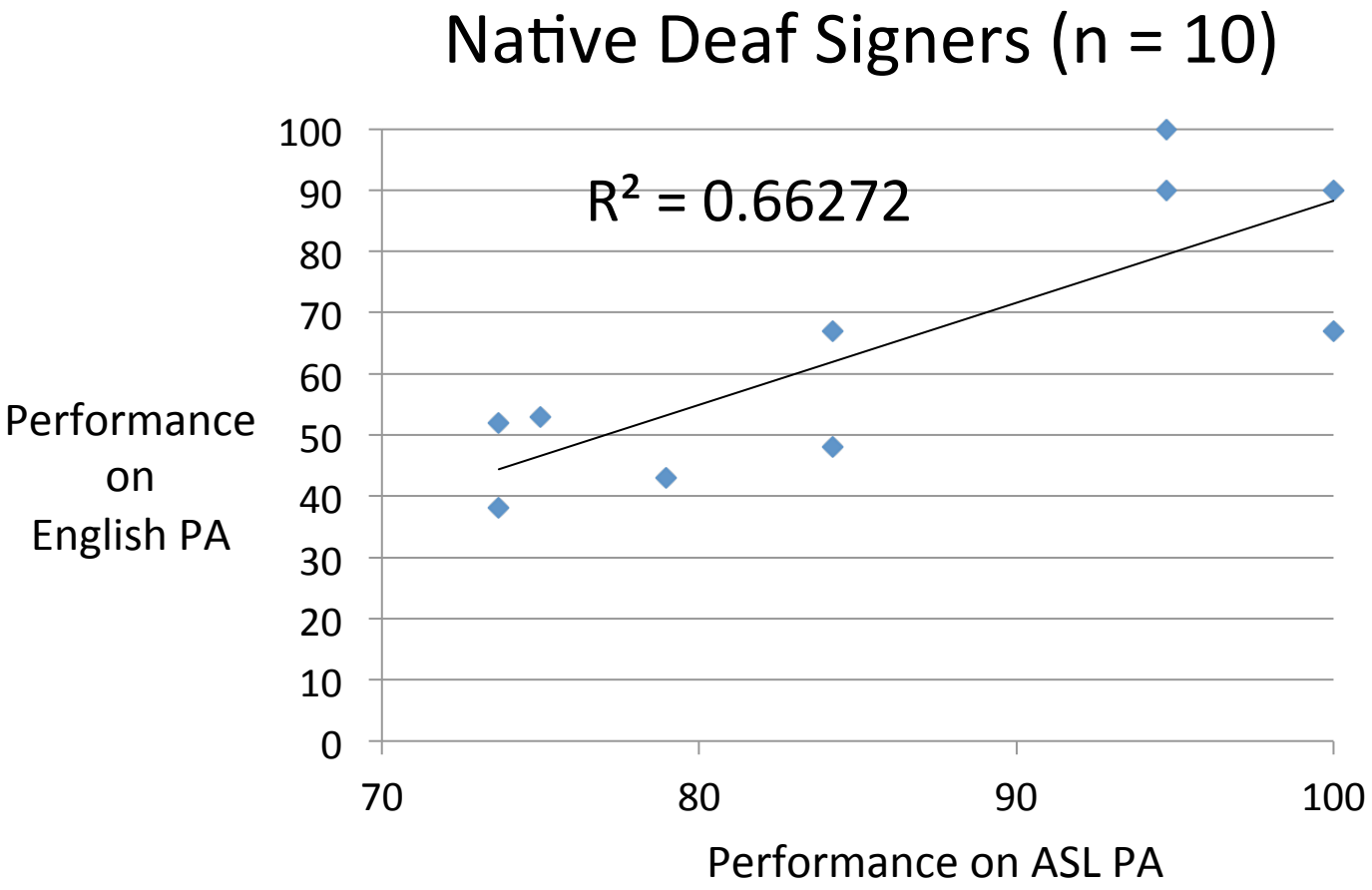


Monolingual

Advantages of being bilingual

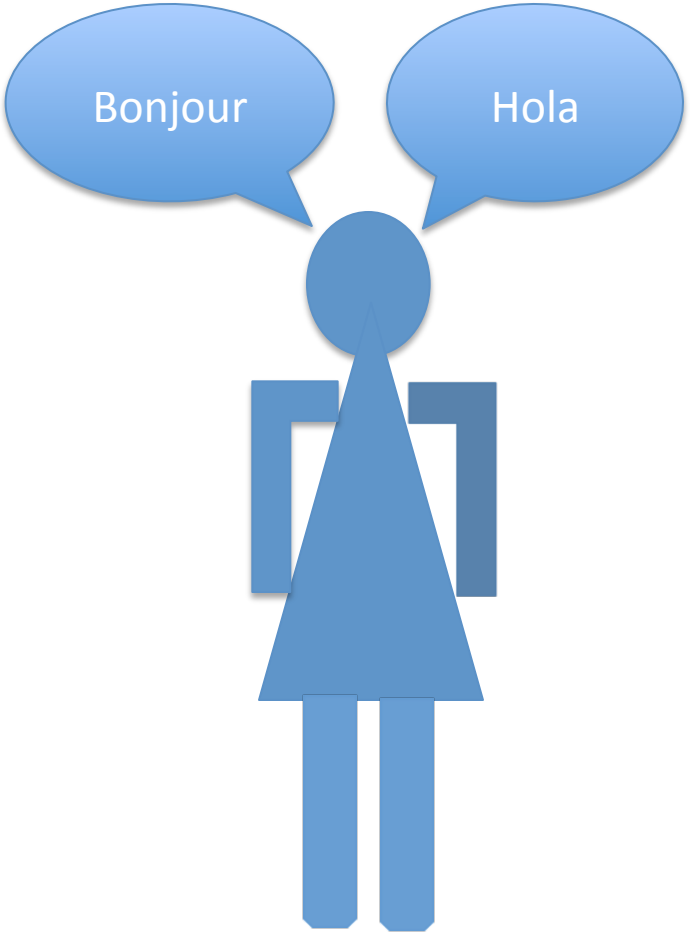
- Being able to learn new words easily
- Playing rhyming games with words like "cat" and "hat"
- Breaking down words by sounds, such as C-A-T for cat
- Being able to use information in new ways
- Putting words into categories
- Coming up with solutions to problems
- Good listening skills
- Connecting with others

Relationship between ASL Phonological Awareness and English Phonological Awareness



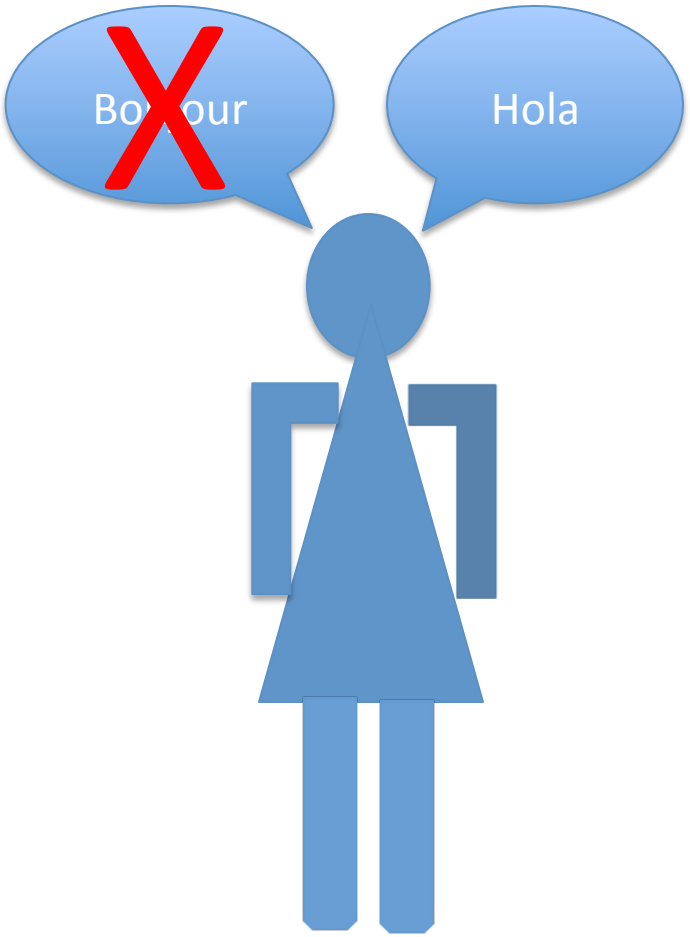
Corina et al 2013

Bilinguals & Executive Control



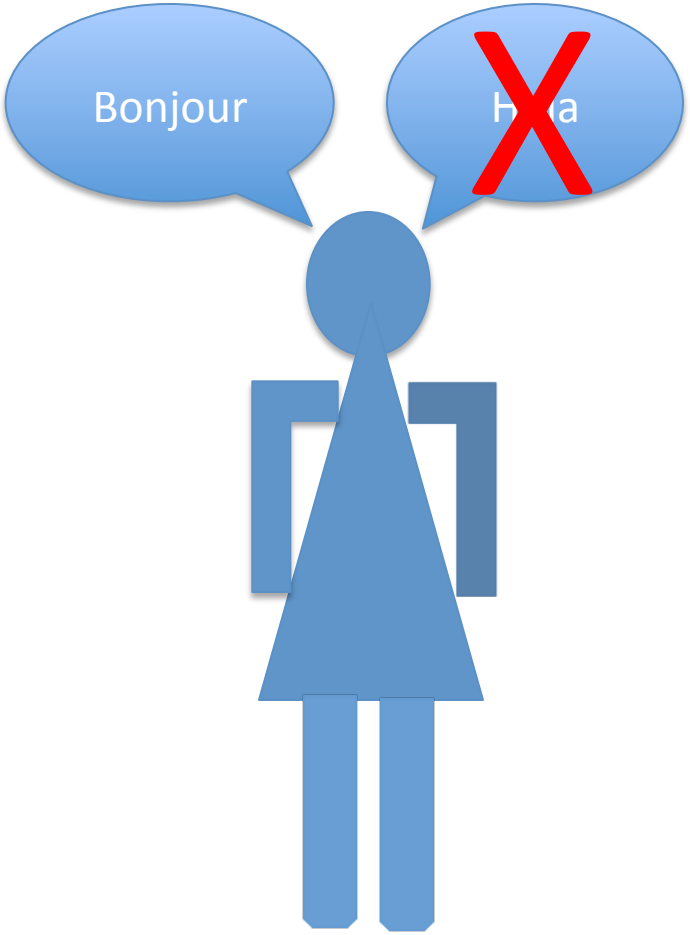
Need for Control and Inhibition

Bilinguals & Executive Control



Control and Inhibition

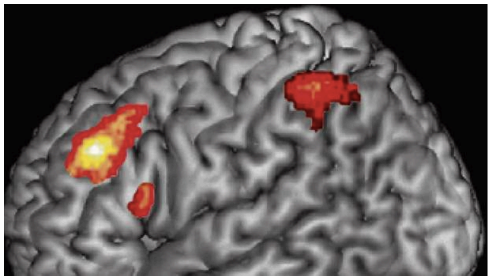
Bilinguals & Executive Control



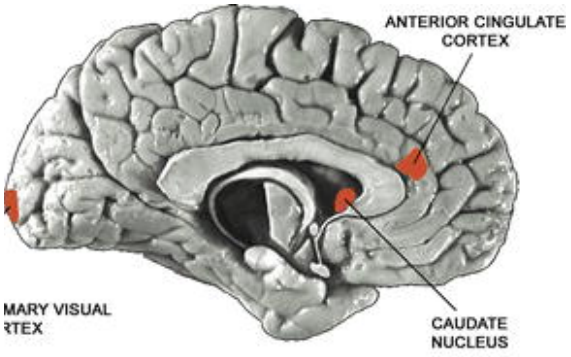
Control and Inhibition

Bilingualism and the Brain

- Greater Reliance upon executive control networks
- DLPC/IFG
- Parietal lobe



- Anterior cingulate
- Caudate



Abutalebi et al., 2008; Ali, Green, Kherif, Devlin, & Price, 2010

Executive Function

Regulates, controls and manages thought and actions

Bilingual Advantage

Bilinguals have more experience with language switching functions. Leads to measurable differences in executive control circuits

Bialystok et al 2008, 2010,

Signed Language Advantages

- Sign Language and the brain
  - Same neural structures
  - Increased reliance on vision and spatial processing

- Cognitive Affordances
  - Visuo-spatial development
    - Face processing
    - Action recognition
    - Mental rotation

- Social Emotional Affordances
  - Community
  - Appreciation of diversity

Goal of Raising a Child

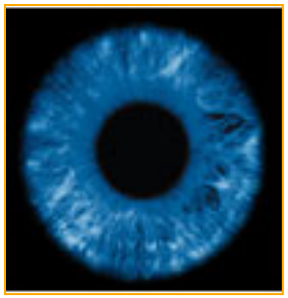
- Many associations formed
  - Learning
  - Vocabulary as predictor of success.
  - Linguistic form
  - Skilled Motor structure
    - Piano playing
    - Spelling
  - Expressive “Body as grammar”
- Rich experiences
- Diverse population

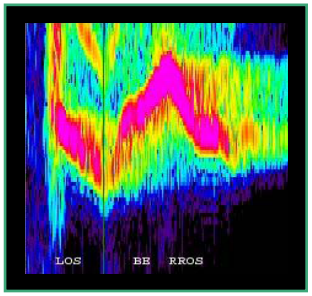
Emerging Opportunties

- CUHK Co-enrollment program
  - Highly unique language program
  - Stimulating learning environment
  - Early language and communication skills
  - Enriched brain stimulation

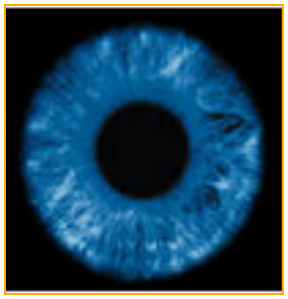
Early language is important,

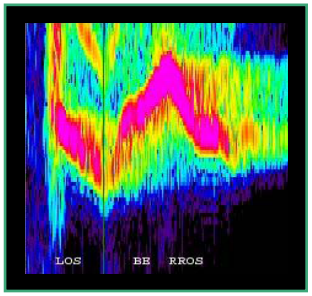
Any accessible language !





Thank You !



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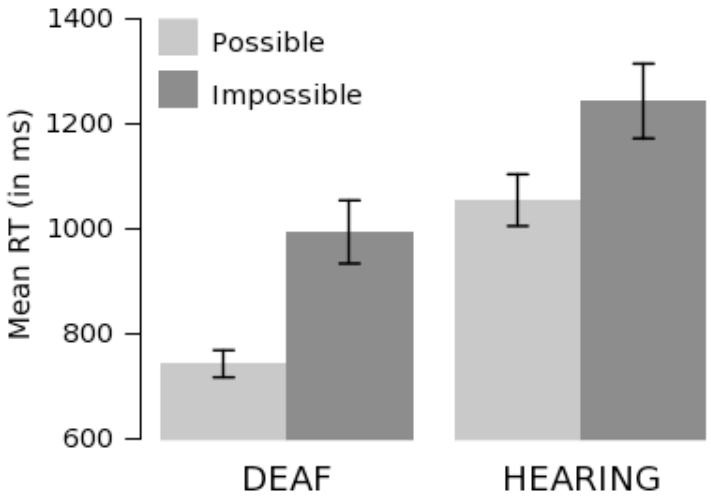
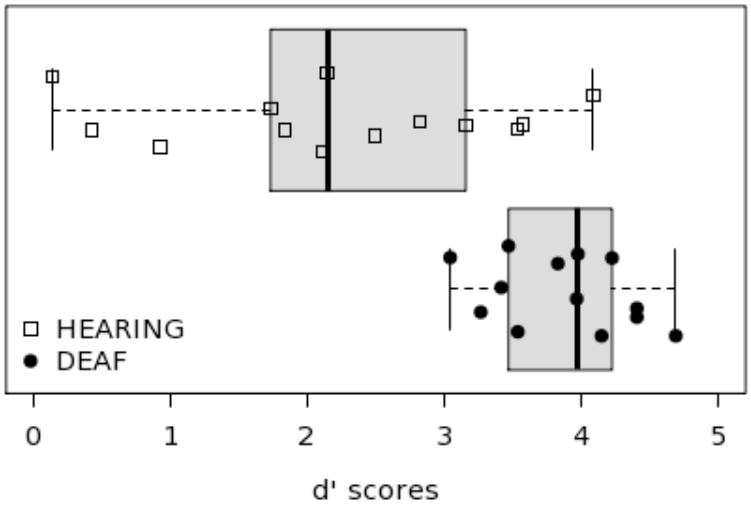
Possible Impossible Signs

(a)

(b)

(c)





(d)