

Visual Bilingualism

Insights into the Nature of Second Language Learning from Sign Languages

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Sign Languages

- Are natural languages
- Structured like natural languages
 - Lexicon
 - Phonology
 - Morphology
 - Syntax
 - Semantics
- Perceived with the eyes and sent with the hands

Does the visual nature of sign languages alter language *comprehension*?

- Acquisition of syntax and morphology
 - *no*
- Syntactic & morphologic processing
 - *no*
- Neural-linguistic processing
 - *no*

Sign Languages Inform Theory

- Linguistic structure transcends modality
- Language processing transcends modality
- Acquisition of linguistic structure transcends modality
- Neurolinguistic processing transcends modality

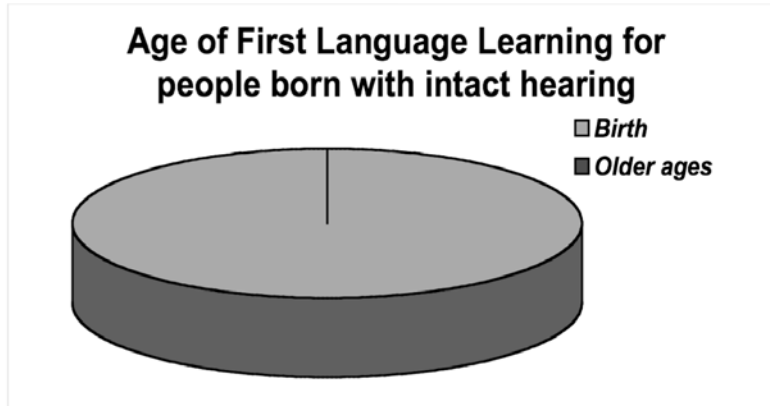
END OF STORY?

Sign Languages Elucidate the Role of Early Experience in L1 & L2 Acquisition

- How complete does the input need to be?
- Does the age when the input begins matter?
- Can a L1 visual language transfer to a L2 spoken language?

Context of Sign Language Acquisition

Age of First Accessible Language Input is Homogeneous for Hearing Children



Age of First Language Input is Heterogeneous for Children Born Deaf



Why?

- Age of detection
- Age of intervention
- Variable success of spoken language learning
- Lack of sign language input in the environment
- Beliefs about language acquisition



- *Language acquisition is fragile*
- *Child can cope with only one language*
- *Never a visual language*

Signing With Your Baby

<http://www.signingbaby.com/index.html>

Signing with hearing babies is popular in North America

- *Language acquisition can be multi-modal*
- *Signs reduce frustration*
- *A visual language fosters spoken language*

Sign Languages Illuminate the Role of Early Experience in L1 & L2 Acquisition

- Does the age when the input begins matter?
- What are the effects of AoA on the architecture of the linguistic system for the L1 and the L2?
- Can a L1 visual language transfer to a L2 spoken language?

4 Experiments

- ASL Grammatical Processing
 - AoA effects on L1 sign language
- English Grammatical Processing
 - AoA affects L1 > L2
- ASL Lexical Recognition
 - AoA affects processing of word structure
 - Hints how L1 supports L2

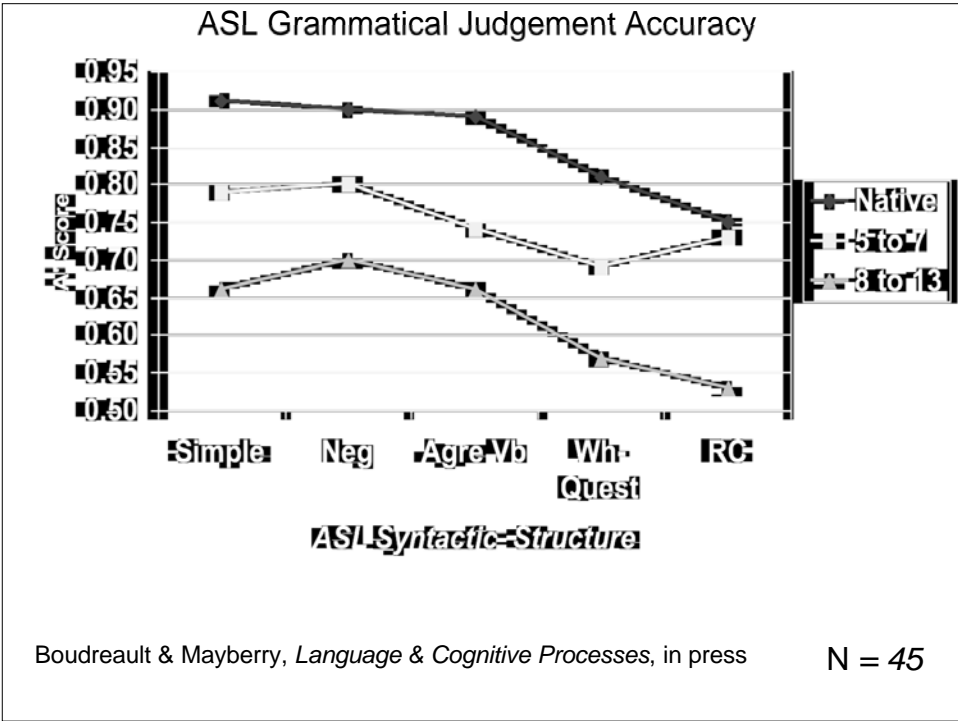
Experiment I: ASL Grammatical Processing

Does AoA affect outcome of ASL acquisition?


Developmental Sequence of ASL Structures

Mayberry & Squires, *Encyclopedia of Language & Linguistics*, 2006


<i>Structure</i>	<i>Age</i>	<i>Study</i>
2 word stage -uninflected signs	1;0 to 2;6	Meier, '87
Negation	1;2 to 3;0	Anderson & Reilly, '97
Nominal Establishment	3;0	Van , O'Grady & Bellugi '87
Verb agreement	2;6 to 3;6	Meier, '87
<i>Wh</i> - questions -manual -nonmanual	1;7 to 2;6 3;0-3;6	Reilly & McIntyre, '91 Reilly & Province '93
Conditionals -manual -nonmanual	3;0 to 5;0	Reilly, Bellugi & McIntyre, '90
<i>Classifiers</i>	3;0 to 8;0	T. Supalla, '82 Schick, '90



Are AoA effects on L1 and L2 outcome the same?



L1 Urdu
L2 English

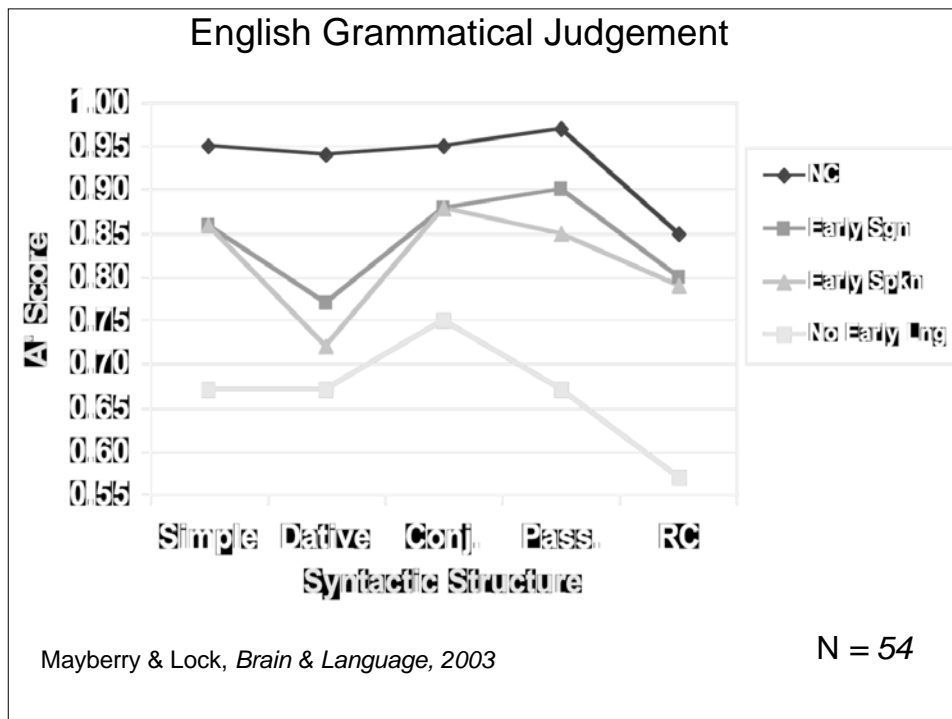


For Deaf Signers:
What is the L1?
Is ASL the L2?

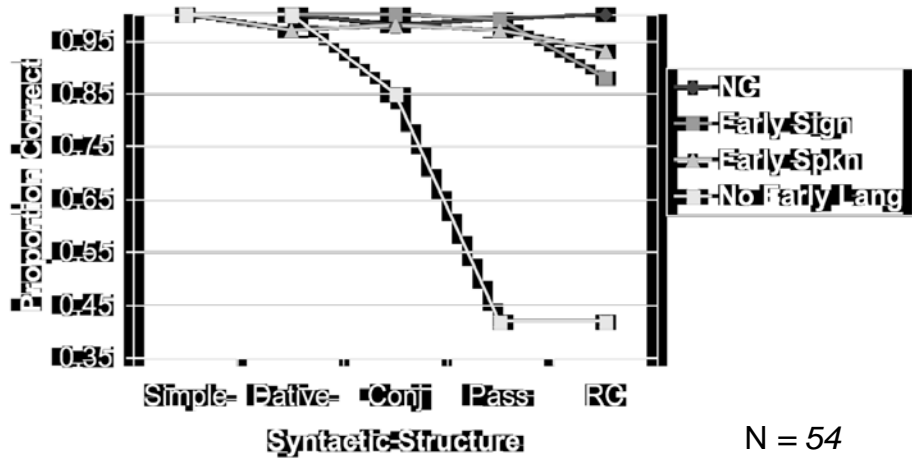
AoA affects the grammatical outcome of L1 sign language

Does AoA affect the outcome of L1 and L2 same way?

Experiment II: English Grammatical Processing



English Picture-to-Sentence Matching



Mayberry & Lock, *Brain & Language*, 2003

L2 grammatical outcome is better predicted
by richness of L1 acquisition than AoA

Does AoA affect visual word recognition?
Effects for L1 = L2?

Experiment III:
Sign Recognition

Signs Have Sublexical Structure



B. Target: AND



B. Error: SLEEP

Sign Parameters

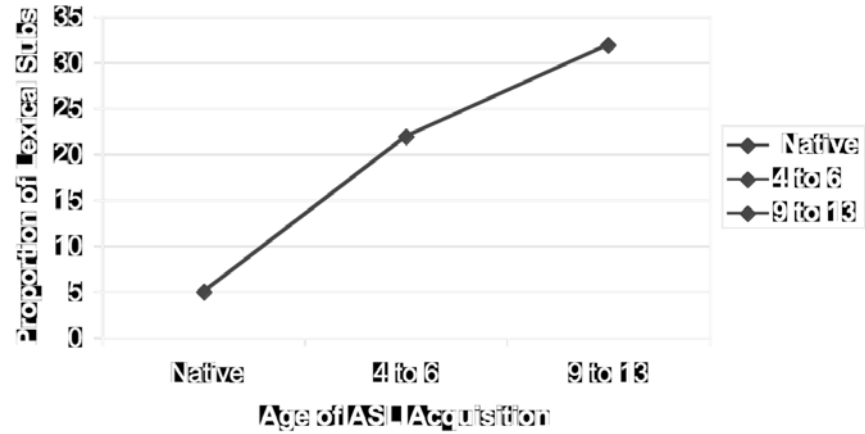
- Handshape
- Orientation
- Movement
- Location

Phonological Minimal Pair

Evidence for Sign Phonology

- Sign language production:
 - Slips of the hand
 - STM errors
 - Child acquisition
 - Aphasic lexical errors
- Sign language perception-comprehension:
 - Native signers different from non-natives
 - No other evidence for on-line phonological processing

Phonologically Based Lexical Errors on Sentence Memory



Mayberry & Eichen, *J of Memory & Language*, 1991

“I ate too much turkey sleep potatoes.”

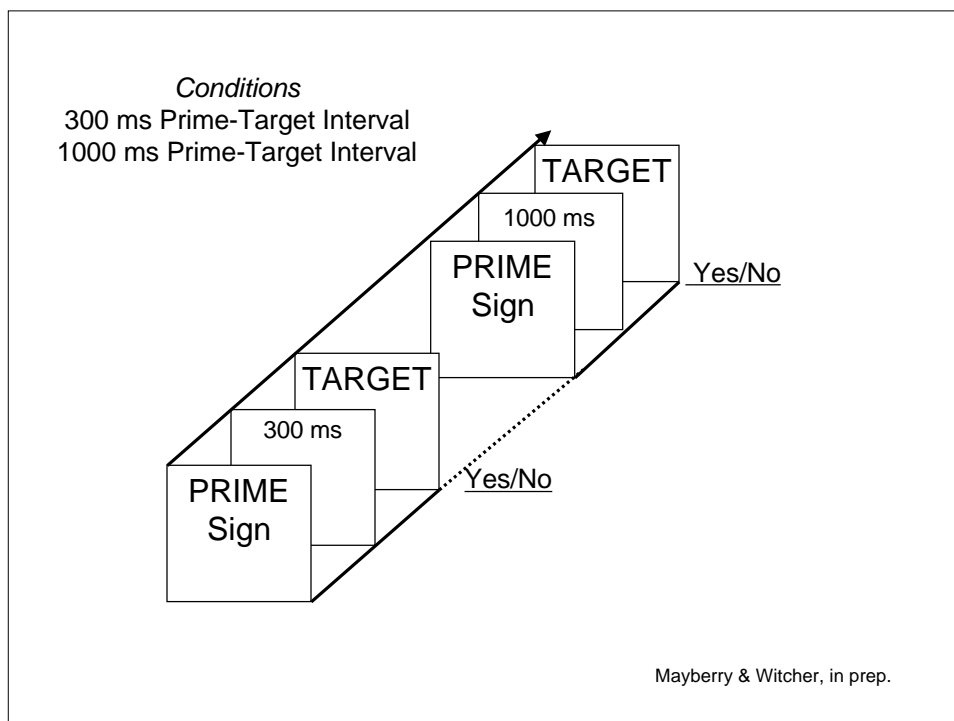
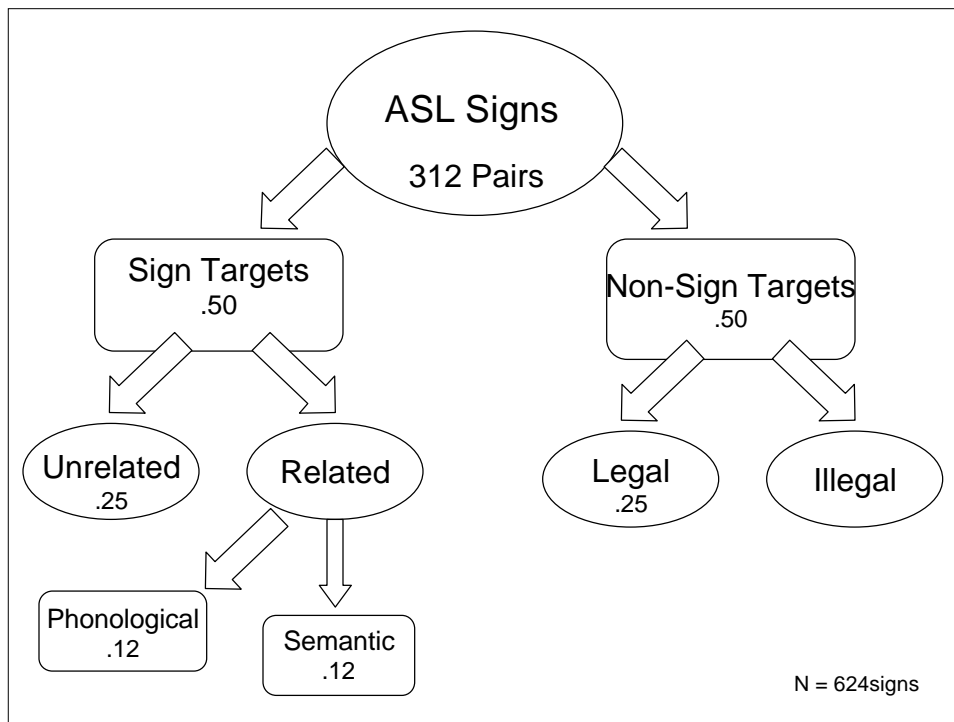


B. Target: AND



B. Error: SLEEP

Mayberry & Fischer, *Memory & Cognition*, 1989

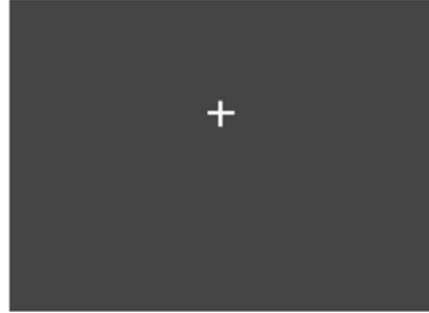


300 Msec Inter-Sign Interval

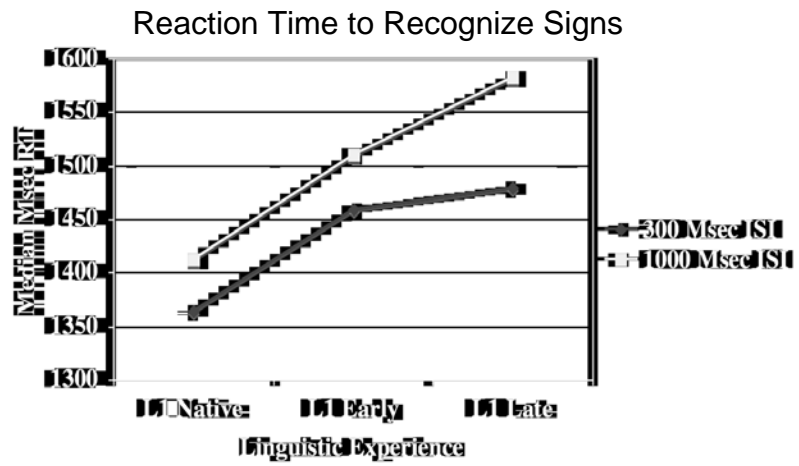


Semantic Prime

1000 Msec Inter-Sign Interval



Phonological Prime



N = 64

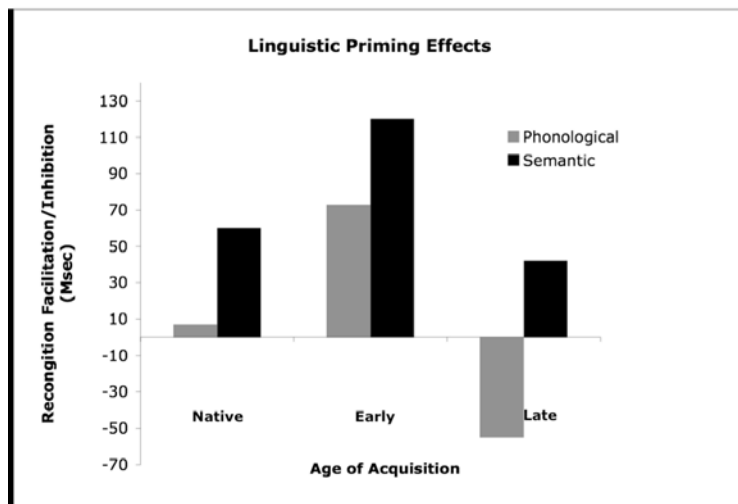
Mayberry & Witcher, *in prep*

Priming Effects

Facilitation = Faster Responding
Inhibition = Slower Responding

In relation to RT for 'No Relation' pairs
minus RT Phonological pairs
minus RT Semantic pairs

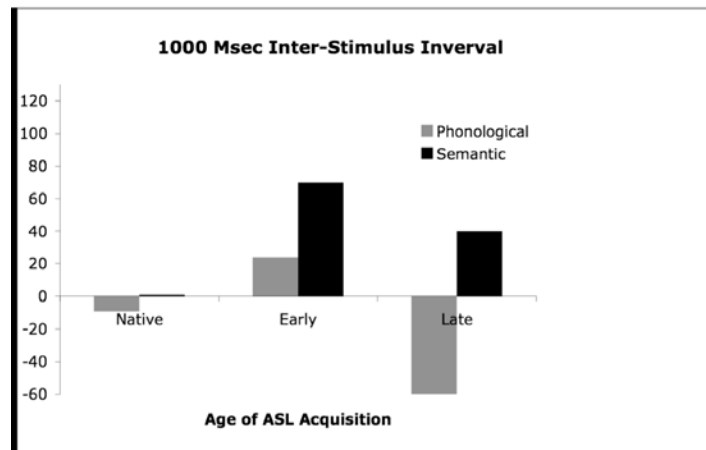
Priming at 300 msec Inter-Sign-Interval



All groups show semantic priming (+)
Native and early learners show phonological facilitation (+).
Late L1 learners show phonological inhibition (-).

Mayberry & Witcher, 2006, in prep

Priming at 1000 msec Inter-Sign-Interval



Native learners' sign recognition is no longer sensitive to sign context.
Early and late L1 learners continue to show semantic facilitation (+)
Early learners continue to show phonological facilitation (+).
Late learners continue to show phonological inhibition (-).

Mayberry & Witcher, 2006, in prep

AoA effects on Lexical Organization in a L1 Visual Language

- AoA affects time to recognize signs with no linguistic relation
- AoA does not affect semantic priming, except:
 - Native learners are unaffected by linguistic context after 300 msec
- AoA shows specific effects on phonological processing
 - Facilitation:
 - 300 msec ISI: Native & early L1 learners show phonological facilitation
 - 1000 msec ISI: Early L1 learners show prolonged phonological facilitation
 - Inhibition:
 - 300 msec ISI: only late L1 Late learners show phonological inhibition
 - 1000 msec ISI: only Late L1 learners show prolonged phonological inhibition

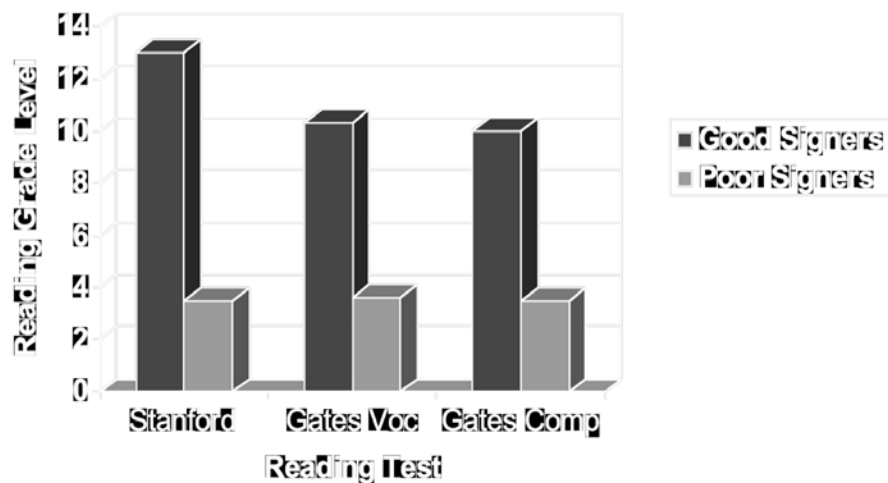
L2 grammatical outcome is better predicted by richness of L1 acquisition than AoA

Evidence for bilingual L1 visual and L2 spoken lexical Organization and representation related to AoA of L1

Can L1 ASL acquisition support L2 English reading?

Experiment IV: L1 Acquisition Supports L2 Reading

ASL Grammatical Skill and English Reading



N = 41

Chamberlain & Mayberry, *under review*

Sign Languages Illuminate the Role of Early Experience in L1 & L2 Acquisition

- Can a L1 visual language transfer to a L2 spoken/read language?
 - Yes
 - Mind organizes language by linguistic structure, not modality
 - Apparent for syntax and the phonological level of the lexicon
- Does the age when the language input begins matter?
 - Yes, early childhood input is critical for L1 acquisition
 - Child's mind needs linguistic input to organize the language system, especially the complex connections between phonological form, lexical meaning, and grammar

Thanks to the Deaf Communities of:

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- Ottawa
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- Edmonton
- Chicago
- Detroit

<http://www.mcgill.ca/mayberrylab/>

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