Aspects of Sign Input to Deaf children of Deaf parents

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Introduction
Relationships between language input and child language development

• Child-directed speech often has specific formational and grammatical modifications (exaggerated prosody, high pitch, simple structures)

• Large literature shows relationships between parental language measures and children’s language development along with other factors including SES (Dollaghan et al. 1999) and genetics (Dale et al. 2015)

• Studies also show relationships between input and later development in some domains (Huttenlocher et al. 2010)

• Not every aspect of language shows specific relationships (Newport, Gleitman & Gleitman 1977)
Vocabulary

• Measures of input *quality* relate to child vocabulary skill at different points in development, even with SES and quantity of input controlled (Rowe 2012)
  • 2\textsuperscript{nd} year: quantity
  • 3\textsuperscript{rd} year: diversity
  • 4\textsuperscript{th} year: decontextualized language

Measures of lexical diversity in vocabulary:

• Type-Token Ratio (TTR)
• Number of Different Words (NDW)
Morphosyntax

• Mothers may be sensitive to the child’s growing linguistic competence, though relations between input and child’s level are complex (e.g., Nelson et al. 1984)

Measures of morphosyntax:

• Mean Length of Utterance – MLUw, MLUm, MLU10 (Brown 1973)
  • Based on 100 utterance sample, excluding imitations, routines
  • Variation across languages in steepness of developmental curve

• Index of Productive Syntax (IPSyn) (Scarborough 1990)
  • Based on 100 utterance sample
  • 1-2 points given for use of target structures
Previous studies of child-directed signing

✓ Modifications to sign size, space (Erting et al. 1990, Holzrichter & Meier 2000, Masataka 2000, Pizer et al. 2011)

• Vocabulary that increases in diversity over time, predicting child’s development?
  • van den Bogaerde (2000) found no systematic increases over time in Type-Token Ratio of mother’s NGT input to deaf children

• Simplification of sentence structure, with growing complexity over time?
  • Kantor (1982), van den Bogaerde (2000) found little increase in MLU
Research questions

• How do Deaf Mothers change their signing (vocabulary, morphosyntax) over time when addressing their Deaf children?
• How does the children’s linguistic development relate to their Mothers’ signing?
• How do different measures of linguistic complexity compare when studying this relationship?
Methods
Participants

• Two children recorded longitudinally ages 1;04-4;01
• Spontaneous production during naturalistic play
• Interlocutors: Deaf parents; Deaf or hearing, signing experimenters

<table>
<thead>
<tr>
<th>Child</th>
<th># sessions</th>
<th>age begin</th>
<th>age end</th>
<th>time observed (hrs:mins)</th>
<th>est. # gloss tokens</th>
<th>est. # child utts.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABY</td>
<td>79</td>
<td>1;04.22</td>
<td>3;04.07</td>
<td>73:43</td>
<td>130,000</td>
<td>16,600</td>
</tr>
<tr>
<td>NED</td>
<td>44</td>
<td>1;05.28</td>
<td>4;01.28</td>
<td>40:00</td>
<td>60,000</td>
<td>9,000</td>
</tr>
</tbody>
</table>

Lilo-Martin & Chen Pichler (2008); SLAAASH project
https://slla.lab.uconn.edu/slaaash/
Data and Annotation

• 10 Sessions across age range for each child chosen for analysis
• Gloss Annotation conducted under SLAAASH project conventions
• Addition of Addressee tiers to distinguish child-directed signing
  • Body orientation and eye gaze to child
  • 96% reliability across 2 coders
• Identification of 100 analyzable utterances
  • Prosodic breaks, meaning, grammar used to choose Syntactic Units
  • 83% reliability across 2 coders
NDW coding

• 100-word sample
• Calculate total number of different words in sample
  • all inflected forms considered the same word
  • IX included, but only distinction between IX(self) & IX(other)
    • same for POSS and SELF
  • For depicting signs, only different handshapes were considered different words
MLU coding

• 100-utterance sample
• Includes IX, but only when produced in combination with other signs
• Each lexical sign considered 1 word
• For depicting signs, each handshape that represents an object considered a word
• MLU10 is the mean of the 10 longest utterances
• 98% reliability across 2 coders

ASL-IPSyn coding

- 100-utterance sample
- 73 different items across 5 categories:
  - Noun
  - Verb
  - Depicting Signs
  - Questions/Negation
  - Sentence Types
- Up to 2 points for each item, if used in at least 2 different contexts
- 87% reliability across 2 coders

Lillo-Martin, Goodwin & Prunier (2017)
Results
NDW

- Children’s NDW increases over time
  Aby: $r(8) = .60, p = .03$
  Ned: $r(8) = .62, p = .03$
NDW

• No relationship between Mothers’ NDW and their child’s

  Aby: \( r(8) = .27, p = .23 \)  
  Ned: \( r(8) = .10, p = .39 \)
MLUw

- We see little increase over time in MLUw for either children or mothers

Aby: $r(8) = .08, p = .41$

Ned: $r(8) = .16, p = .33$
MLUw

- Mothers’ MLUw is not related to their children’s

  Aby: $r(8) = .40$, $p = .13$  
  
  Ned: $r(8) = -.33$, $p = .17$
MLU10

- Children’s MLU10 does show increase over time

Aby: $r(8) = .55, p = .05$

Ned: $r(8) = .53, p = .06$
MLU10

- Mothers’ MLU10 is not related to their children’s
  Aby: $r(8) = .21, p = .30$
  Ned: $r(8) = -.08, p = .42$
ASL-IPSyn

- Children’s IPSyn increases over time

**Aby:** $r(8)=.94$, $p<.0001$

**Ned:** $r(8) = .74$, $p = .007$
ASL-IPSyn

• Moderate relationship in IPSyn between Aby and her Mother, but not for Ned and his mother

Aby: $r(8) = .47, p = .09$  \quad \text{Ned: } r(8) = -.16, p = .33
Discussion
Vocabulary

• We observed consistent growth in vocabulary for the children, but no relationship between children’s scores and their mothers’
• In general, the mothers start at a higher level than the children, and do not increase much, with high variability across sessions
• The average and range of NDW was slightly higher for Ned’s mother than Aby’s mother, but slightly higher for Aby than Ned (ns by t-test)
MLU

• MLUw does not show clear development in these data but is highly variable across time

• Similar results found for other sign languages (e.g., NGT, van den Bogaerde 2000)

• Sign languages may be numerically more similar to Cantonese-type languages (mean MLU=3.0 age 42 months; Klee et al. 2004)

• MLU10 more reflective of language growth in children, but again, we see no relationship between mothers and their children

• MLU scores highly dependent on calculation of syntactic units, known to be challenging in sign language research (Fenlon et al. 2007)
ASL-IPSyn

• ASL-IPSyn robustly captures language development in these children
• Aby’s Mother’s scores increase with hers, but Ned’s mother uses more complex structures from early on
• Specifically designed to include range of structures typically acquired over the observed period
  • Needs further validation with additional data
Child-Directed Signing Summary

- Although we did not specifically analyze modifications in signing form, we did observe that both mothers used them, including
  - Modifications of signing size
  - Signing on the child’s body
- Aby’s mother also seems to have modified grammatical aspects of her signing – possibly this could become more clear with more data analyzed
- Ned’s mother seems to be using a more adult-like register in her ASL grammar
Conclusions

• We have not found a strong relationship between children’s vocabulary and grammatical development and their mother’s signing to them

• However, these data come from only two dyads

• Differences between Aby and Ned and their mothers hint at individual differences
Thank you!