



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)
 - 2nd year: quantity
 - 3rd year: diversity
 - 4th 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

| Child | # sessions | age begin | age end | time observed (hrs:mins) | est. # gloss tokens | est. # child utts. |
|-------|---------------|-----------|---------|--------------------------------|---------------------------|-----------------------|
| ABY | 79 | 1;04.22 | 3;04.07 | 73:43 | 130,000 | 16,600 |
| NED | 44 | 1;05.28 | 4;01.28 | 40:00 | 60,000 | 9,000 |

Lillo-Martin & Chen Pichler (2008); SLAAASh project https://slla.lab.uconn.edu/slaaash/



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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



Lillo-Martin, Berk, Hopewell-Albert & Quadros (2015)

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



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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



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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



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 IPSyn - Aby



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Ned: r(8) = .74, p =.007
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IbSyn Score



Child's Age (months)





ASL-IPSyn

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

Ned: *r*(8) = -.16, *p* = .33

Aby: *r*(8) = .47, *p* = .09

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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



