Lessons from the Crib: What’s New In Language Development?

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Disclosures for Roberta Michnick Golinkoff

• I have written several books that cover language development (in whole or part) for which I receive royalties: How Babies Talk, Einstein Never Used Flash Cards, Becoming a Word Learner, Action Meets Word, A Mandate for Playful Learning in Preschool, and Becoming Brilliant.

• With J. deVilliers, Aquiles Iglesias, Kathy Hirsh-Pasek, and Mary Wilson, I created the QUILS language screener for 3- through 5-year-olds being brought out in Spring by Brookes. I will receive royalties.

• I also hold grants from IES and NSF.

I am going to make you work!

• Find someone to sit next to so you have a working buddy
• Be in groups of 2 or 3 so you can easily talk

What are 3 things typical hearing babies know about language in the first year of life?

Multiple choice test

• Discuss with your buddy:
What do you think are the right answers to these questions about typical babies? WHY do you think so?

Babies recognize their own names at
A) 2 months
B) 4 months
C) 6 months
D) Adolescence (when they choose not to respond anyway)

2. At what age can typical babies use word order to understand sentences like, “Big Bird is tickling Cookie Monster? vs. Cookie Monster is tickling Big Bird”?
A) 6 months
B) 13 months
C) 17 months
D) 25 months?
And off we go – journey into the first year of life for typical hearing babies...

But wait... Why care about language?

Everyone is talking about...

- The 30 million word gap
- The grade level reading campaign
- Universal pre-school

What unites each of these initiatives?

Hmmmm...
They each rely on strong language skills.

And strong language skills...

- Come from having high quality language environments where adults and children engage in conversations - even before children can talk! -- on topics of interest to children

We privilege language, including it as one of the 6C’s: collaboration, communication, content, critical thinking, creative innovation, confidence.

Language is essential for success:
- Speaking persuasively
- Writing clearly for international collaborations,
- Lost art of listening!

How does language happen?
What do typical HEARING babies learn about language in the first year of life?

Another way to think about this: what are deaf babies missing by getting cochlear implants at 12 months or later?

Some assumptions about babies!

Born pattern seekers! If there is a visual or auditory pattern, they will find it.

Eager to learn – regardless of ethnic background or social class – Gopnik story in WSJ study by Begus et al.

Highly social – learn better with people present than not

Today’s talk: 4 parts

I. What scientists hear in the study of language
II. What scientists don’t hear… or see
III. What do babies know about language and when do they know it?
IV. Outreach: How can we “languagize” the environments children are in?
Part I: What scientists hear…

Original theories of language development based on PRODUCTION, or what the child could say

What you hear: Landmarks in production

- 0-3mo: coos
- 3-6 mo: coos; laughs
- 6-9 mo: canonical babbling "ma ma da da"
- 9-12mo: the “imperial point”; first words; variegated babbling: "bada"
- 9-12 mo: Some do jargon
- 12-18mo: 2 words per week;
  - names for body parts, animals, foods, family

0-3mo: coos
Really? Do you have to wait until the age of full term birth for neonates to vocalize?

- Premature babies - 32 weeks vocalize in the NICU.
- Vocalizations increase over time
- When parent present, vocalizations increase significantly more than when parent not present

Significance: Adult-child interactions supportive of language development, start immediately after birth.

A cautionary note

- Wide individual differences
  - Groups
  - Individuals
  - Cultures

Take, for example, jargon – not all children do it.

Part II: What scientists don't hear…

Current theories - based on what you can’t hear or see with the naked eye….

The last 50 years: A revolution in our understanding of early language development
Fueling this revolution?

A host of new methodologies → a window into the baby’s mind!

The High Amplitude Sucking Paradigm

Perception of sounds

The Intermodal Preferential Looking Paradigm

(Golinkoff & Hirsh-Pasek)

Habituation

Headturn Preference Procedure

Phonological, prosodic discrimination, segmentation

And many more!!
These new methods are revealing

- Amazing infant competencies in segmenting the sound stream and the world’s events
- How infants map sounds to meanings they stand for
- Infants’ ability to use social cues in determining word and sentence meaning
- How infants zero in on the syntax of their language

Part III. What do babies know about language and when do they know it?

Language learning begins in the womb

EIGHT MONTHS

Babies are eavesdropping on every conversation Mom has!

How do we know? Sucking paradigm when they emerge

Consider the study conducted by Moon et al...

Hypothesis:
Fetuses learn their native language vowels in the womb!
Tested Swedish and US babies

Method:
Non-nutritive pacifier given to neonates [mean age = 33 hours].

Offered
- 16 variants of English /i/ as in “price”
- 16 variants of Swedish /y/ as in “syll”

Question: Will babies suck harder to hear familiar native vowel sounds or unfamiliar non-native vowel sounds?

ANSWER:
Harder sucks to NON-NATIVE vowels means that learning of vowels occurred in the womb!

What cues exist for segmentation?

- Sensitivity to native language stress patterns
  By 9 months (but not 6), babies prefer trochaic stress (strong/weak as in “magic” and “table”).
- Sensitivity to pauses in infant-directed versus adult-directed speech
  - Version 1: Once upon a time, a lady and a witch lived in a house.
    The house was very old and messy.
  - Version 2: Once upon a time, a lady and a witch lived in a house.
    The house was very old and messy.
Baby as Statistician
Saffran, Aslin, & Newport, 1996

Could 8-month old babies detect these low and high probabilities in a sample of artificial speech? Could they find the words?

**YES!**
Listening to only two minutes of speech

Babies discovered that *tokibu* was a word and *latipo* was not.

Using Infant-Directed speech – Baby Talk – helped babies find the words even more readily! (Thiessen et al.)

**Significance:** Baby talk is GOOD for babies! Go ahead and make a fool or yourself! Encourage parents!

Additional cues to segmentation...

- **Sensitivity to frequently occurring words...**

  At what age do babies recognize their own name?

  At 4.5 months babies prefer to listen to their own name

  **But how could this help the baby with segmentation?**

We tested the "Larson Hypothesis"...

At 6 months, babies can remember words they hear in short passages -- **if** those words follow their own names and not someone else's e.g., Sue's bike vs. Joan's cup

They can also recognize words that come after Mommy or Momma (but not Lola)

**Significance:** Babies are processing the speech stream from top-down, using words they know!

Think about what these findings mean....

**Input matters far earlier than we thought!**

During the FIRST 6 MONTHS of life, babies are pulling apart the speech stream, finding the words, calculating statistics, storing frequently occurring words, and more...

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Baby has found some words...

**But what do they mean??????**

How do babies figure out what in the world a speaker is talking about?

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This task is deceptively simple because....

- Take object names or nouns: When we say "rabbit" to a child, how is the child to know what "rabbit" means?
  - Is it the whole rabbit?
  - The rabbit’s running?
  - Or the fur?
  - Or the twitching whiskers?

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Guess: What is the earliest demonstration of babies ‘hooking’ sounds to meanings?

**6 months!**

Find Mommy! Where’s Mommy?

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What else have babies been shown to understand at 6 months?

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**Brace yourself ---**

**About to challenge accepted “wisdom”**

-It is widely accepted that infants begin learning their native language not by learning words, but by discovering features of the speech signal: consonants, vowels, and combinations of these sounds.

Learning to understand words ... is said to come later, between 9 and 15 mo of age, when infants develop a capacity for interpreting others’ goals and intentions” (Bergelson & Swingley, 2011).

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But this is wrong!

Between 6 and 9 months babies understand lots of words: names for body parts, food items, frequently heard words in a baby’s life.

What does this tell us about the importance of language input?

What we know surprises many people!

Learning from 10-week old Ellie

Responding to our babies’ vocalizations matters far earlier than we ever thought!

Babbling matters – rarely taken seriously for language learning

Experiment: Goldstein & Schwade (2014 – Psych Science)
9 months – moms wear earphone interacting with baby
Told when to respond to baby vocals – either immediately or with a 2-second delay
Coded: Baby vocalizations after mom spoke. Did baby imitate mom and produce syllables more in line with the adult model?
YES! But only in condition where mom produced a vocalization temporally contingent on her baby’s vocalization!

SOCIAL FEEDBACK MAKES A DIFFERENCE!

How do babies come to understand what adults are naming for them?

In the first year of life, when learning words, infants are.....

Processing multiple input cues.

Differentially weighing these cues over time.

Differential Weighting: Time 1

Temporal Contiguity
Perceptual Salience
Child Learner
Morphology
Eye Gaze
Grammar
Social Context

Hirsh-Pasek & Golinkoff, 1996
Hirsh-Pasek, Hollich & Golinkoff, 2000
11/17/16

Differential Weighting: Time 2

- Perceptual Salience
- Grammar
- Child Learner
- Temporal Contiguity
- Eye Gaze
- Social Context

Differential Weighting: Time 3

- Perceptual Salience
- Grammar
- Child Learner
- Temporal Contiguity
- Eye Gaze
- Social Context

Word learning changes in the first two years of life

Fido versus Freddy

- Fido learns words associatively
- Freddy learns words by noting the social intent of the speaker

What did we find?

- **10 months:**
  - Child systematically assumes that a label refers to an interesting object (bright, colorful) -- even in the conflict condition when we looked at and labeled the boring object (dull and monochrome).

- **12 months:**
  - Can learn name only for interesting object; no longer mismap.

- **18 months**
  - Can learn name for boring object but still lured by perceptual salience.

- **24 months**
  - Mature word learning.
  - Uses social cues to label boring object; overrides perceptual salience.

- Fido lives!

- Fido fading!
**Summary so far:** What do babies in the first 12 months know about their language?

- **Phonology, prosody, segmentation**
  - Arrive discriminating between the world's phonemes
  - Arrive having learned about vowels of their language
  - 6-8 mo: Can calculate statistics to find syllables that hang together
  - 9 mo: Show sensitivity to native language stress patterns; vocals approximate adults

- **Word learning**
  - 6 mo - Comprehend many frequent words
  - 8 mo - Learning 2 new words at one sitting; little attention to social cues

Answers to our quiz: 1 (B), 2 (C), 3 (A), 4 (B), 5 (B), 6 (B)

**But these findings...**

Haven’t asked yet:

Do babies also know something about grammar?

**Grammar** – the way we arrange our words and morphological particles into sentences – is all about pattern detection

**What do babies know about grammar in the first year of life?**

- **Two mechanisms:**
  - **Statistical pattern detection** - what categories (e.g., N, Adj) can precede or follow what other categories
  - **Algebraic pattern detection** - 7-month-olds – habituated for 2 min
    - sequences like ga ti ga and li na li (ABA ‘grammar’)
    - or ga ti ti and li na na (ABB ‘grammar’)
  - At test – novel triads - wo fe fe and wo fee wo
  - Prediction: If learned pattern should prefer opposite type
  - CONFIRMED

**Mapping sequences of words when learning grammar?**

What is happening here?

*Where is Cookie Monster tickling Big Bird?*

17-month-olds can do this task!


**More on word order**

- 8-month-old Italian and Japanese babies –
  - Headturn Preference procedure
  - Taught an artificial language, e.g., *rix baw teb...*
  - Prefer to listen to sequences that mirror the word order in their language

Note:

Both findings emerge prior to children speaking in full or even partial sentences. **EVEN** prior to saying a single word in their language!


Anne Geddes
Part IV. Outreach

Goal: Improving Language for ALLLL kids

How to change the language trajectory for all children – but especially those from low income families?

Individual level:
- Fighting to keep children with possible language problems from languishing until they are 4 or 5

Classroom Level:
- The California Preschool Curriculum – we created a set of 6 principles for growing language in the classroom – “languagizing”

At the Community Level:
- We can create more quality talk by spurring conversations between parents and children in the places they go

By turning supermarkets in Philadelphia and Delaware into children’s museums

In collaboration with Fresh Grocer

![Image of children at a supermarket]
Supermarket projects:
Tulsa, South Africa, Ohio

RESULTS?

At the Community level: Turning neighborhoods into

URBAN THINKSCAPES

First year of life is full of language discoveries – as these 11-month-old twins girls illustrate!

CONCLUSION: Babies need to do some heavy lifting to learn language but if we help them with our input, tailored to their interests, they can make great progress!

Thanks to....

Funding from ....

The best lab ever

The parents and kids who made the research possible

Thanks for listening!