From coo to code in the baby's first year:
Language development starts *before* implants

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Language can:

- Start wars
- Ruin marriages
- Allow a presentation
The power of language is not in learning the word “cabbage” and the word “Jim” but in learning how to express relations between these words.

“Jim, don’t sit the babies in the cabbage!”
Today -- what are babies missing by getting cochlear implants at 12 months or later?

What do HEARING babies learn about language in the first year of life?
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

**Highly social** – learn better with people present than not
Consider the task that faces the language-learning child

She hears a sound stream – perhaps in more than one language

She has to segment the stream into units – clauses → phrases → words (Jusczyk, Hirsh-Pasek, etc.)

Segment the world into units too – where does running turn into walking?

Figure out how the units she hears map to things in the world

Discover the grammar of her language – How are the words put together?

Assemble and articulate what she wants to say
It’s enough to have you tear your hair out –
and we do when we try to learn a second language as adults

But babies do this before they can
... tie their shoes
... be taken to fancy restaurants

**HOW DO THEY DO IT?**

We can only touch the surface but let’s go!
How does the field approach these questions with babies – nonverbal and bad direction followers?

Host of methods to trick babies into showing their sensitivities...
Language learning begins in the womb

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 “syal”

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!
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.
  – increase over time
  – parent present, vocalizations increase significantly more than when not present


How does the baby carve up the speech stream into units?
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?*
Remember this old Larson cartoon?

**What we say to dogs**
Okay, Ginger! I've had it! You stay out of the garbage! Understand, Ginger? Stay out of the garbage, or else!

**What they hear**
Blah blah GINGER blah blah...
“Ginger” -- or the baby’s name -- may be a wedge that breaks apart the stream of speech! If Ginger is at the end of the sentence, what comes right after it must be a separate unit!
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….

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…
The earliest demonstration of babies ‘hooking’ sounds to meanings?

6 months!

Find Mommy! Where’s Mommy?
“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).

This is wrong!

Bergelson and Swingley -- Tincoff and Jusczyk results are not an anomaly!

Babies between 6 and 9 months understand lots of words: names for body parts, food items, frequently heard words in a baby’s life.
In the first year of life, when learning words, infants are.....

Processing *multiple* input cues.

Differentially weighing these cues over time.

Hollich, Hirsh-Pasek & Golinkoff, 2000
Golinkoff & Hirsh-Pasek , 2008
BABY TALK
HOW EARLY DO THEY LEARN?

ABC NEWS PROGRAM TO EAVESDROP ON AMERICANS WITHOUT A WARPA
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 mo - Can find words in speech stream after own name or momma
  – 6-8 mo - Can calculate statistics to find syllables that hang together
  – 9 mo - Show sensitivity to native language stress patterns
  – 9 mo - Use pauses in infant-directed speech, to find constituents (phrases, clauses)

• Word learning
  – 6 mo - comprehend many frequent words
  – 7 mo – discriminate and form nonlinguistic categories needed for V and PrepIrning
  – 10 mo – can learn 2 new words at one sitting; little attention to social cues
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**

Sensitivity to native language word order

– 8-month-old Italian and Japanese babies –

• Headturn Preference procedure
• Taught an artificial language
• 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!*
What about babies who receive Cis?
CI babies need to do some heavy lifting after implantation!

If they are lucky enough to receive them at around 12 mos of age, they need to make up for a full year without language input.
How do children with CI’s fare?

- Wide end states for children with CIs.
- Some still reading only at a 4th grade level
- Some still need to learn sign
- WHY? Length of time till implantation; social environment support; many factors

In sum...

• Babies in the first year of life are working hard to extract the regularities in the language surrounding them
  – Phonology, prosody
  – Lexical items
  – Incipient grammar

• Children with hearing loss who get Cis need to catch up – and many do!
Thanks for listening!