



COLLEGE OF EDUCATION AND HUMAN ECOLOGY | THE OHIO STATE UNIVERSITY

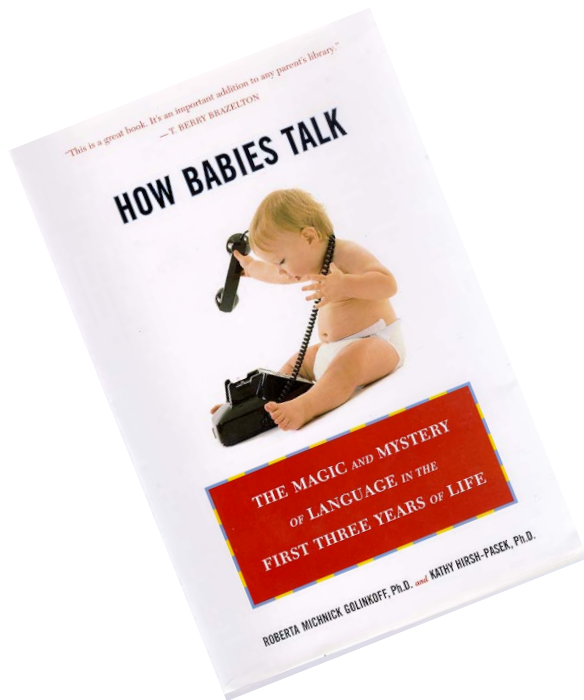
Crane Center for Early Childhood
Research and Policy

Spring Distinguished Speaker



DR. ROBERTA GOLINKOFF

The Magic and Mystery of Language Development: Is it Malleable?



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The fields of Psychology and Education are very specialized



There are cognitive, social-emotional, personality, and social, etc.

Wanna have some fun?



With the person next to you, can you list 3 things typical hearing babies know about language in the first year of life?

Multiple choice test



- What do you and your buddy think are the right answers to these questions about typical babies?
- Mark down the numbers 1-4 and the letter your dyad or triad selected.

1. 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 understand sentences like,
“Big Bird is tickling Cookie Monster?”

A) 13 months

B) 17 months

C) 25 months

D) 30 months

3. By _____ months babies have about 10 words in their *comprehension* vocabulary

- A) 6 months
- B) 16 months
- C) 20 months
- D) 24 months

4. Children can learn language from Skype conversations at

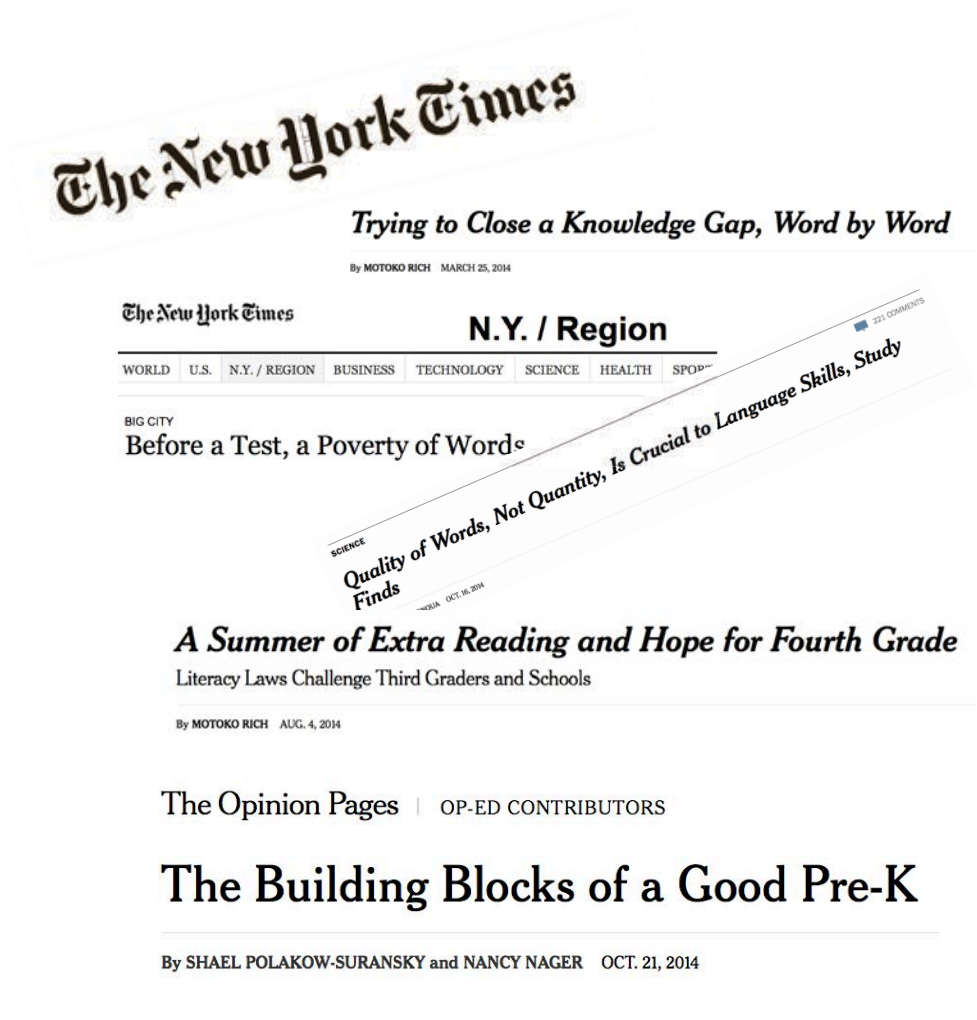
- A) 12 months
- B) 18 months
- C) 24 months
- D) Never – are you kidding?

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?

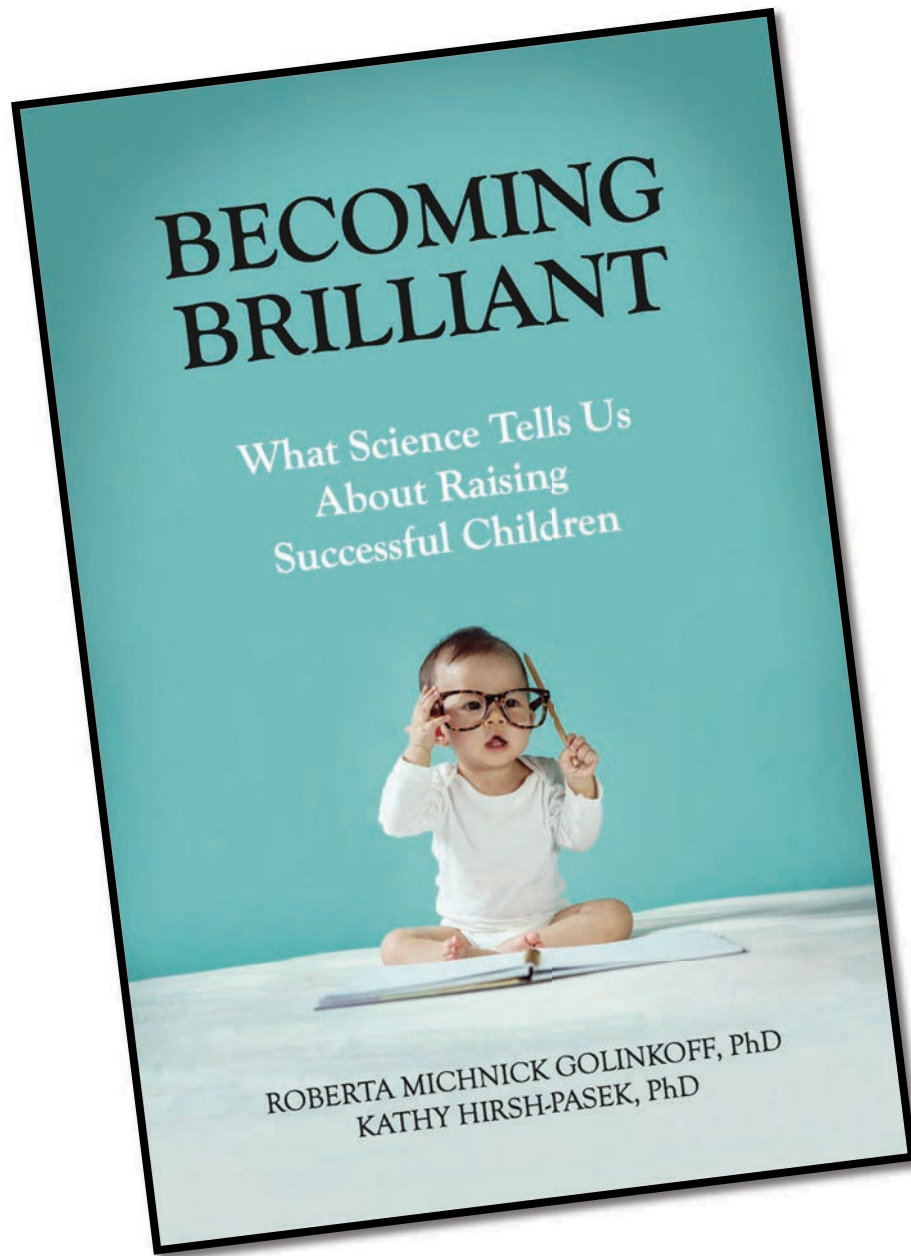
Hmmm...



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**

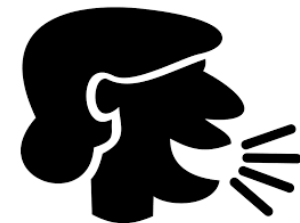




We **privilege language**, including it as one of the 6C's: collaboration, **communication**, content, critical thinking, creative innovation, confidence,

Language is essential for success:

- Speaking persuasively
- School achievement
- Self control!
- Even health outcomes
- Lost art of listening!
- You will be judged your whole by



**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 even later?

Today's talk: 4 parts

- I. What we, as scientists, hear in the study of language
- II. What we don't hear...
- III. What do babies know about language and when do they know it?
- IV. Improving language for all children: **All kids need quantity and quality input**

Part I: What we 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



A cautionary note

- Wide individual differences
 - Groups
 - Individuals
 - Cultures

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



Part II: What we 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

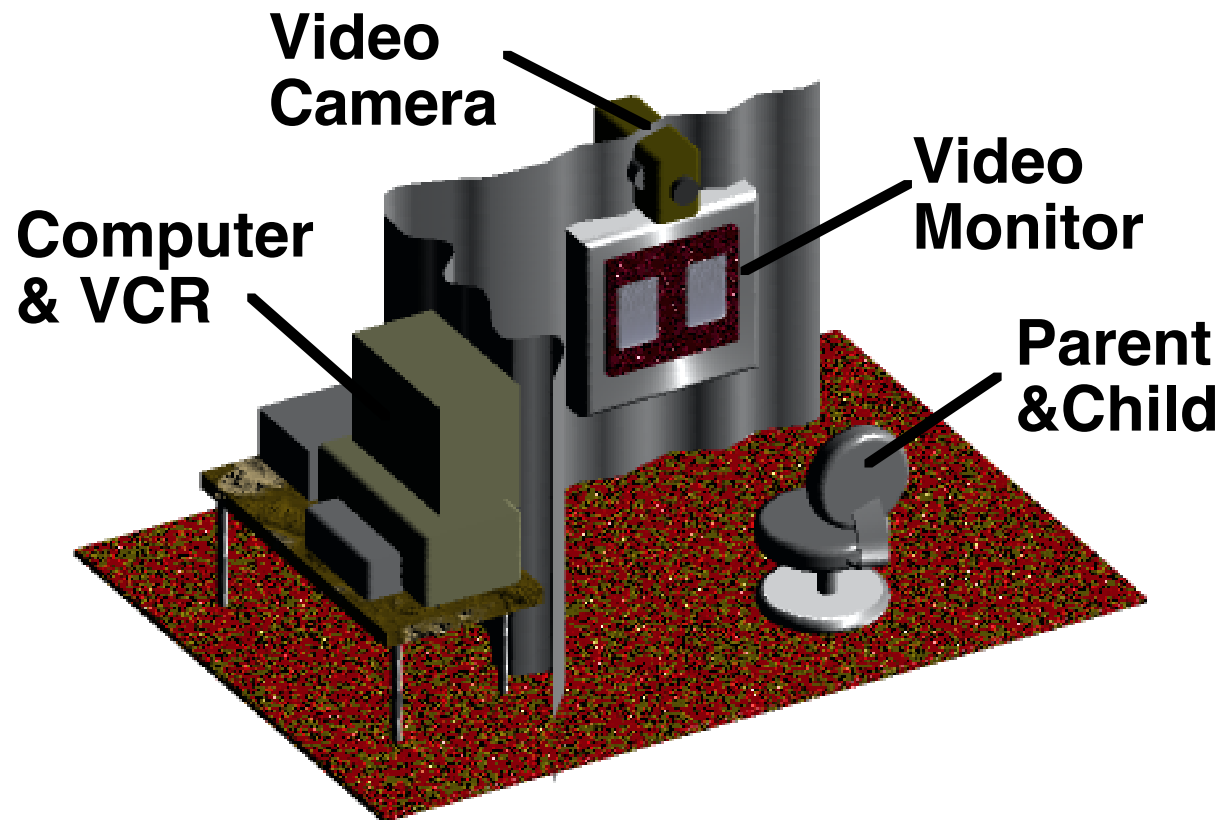
Fueling this revolution?

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



The Intermodal Preferential Looking Paradigm

(Golinkoff & Hirsh-Pasek – developed at UD)

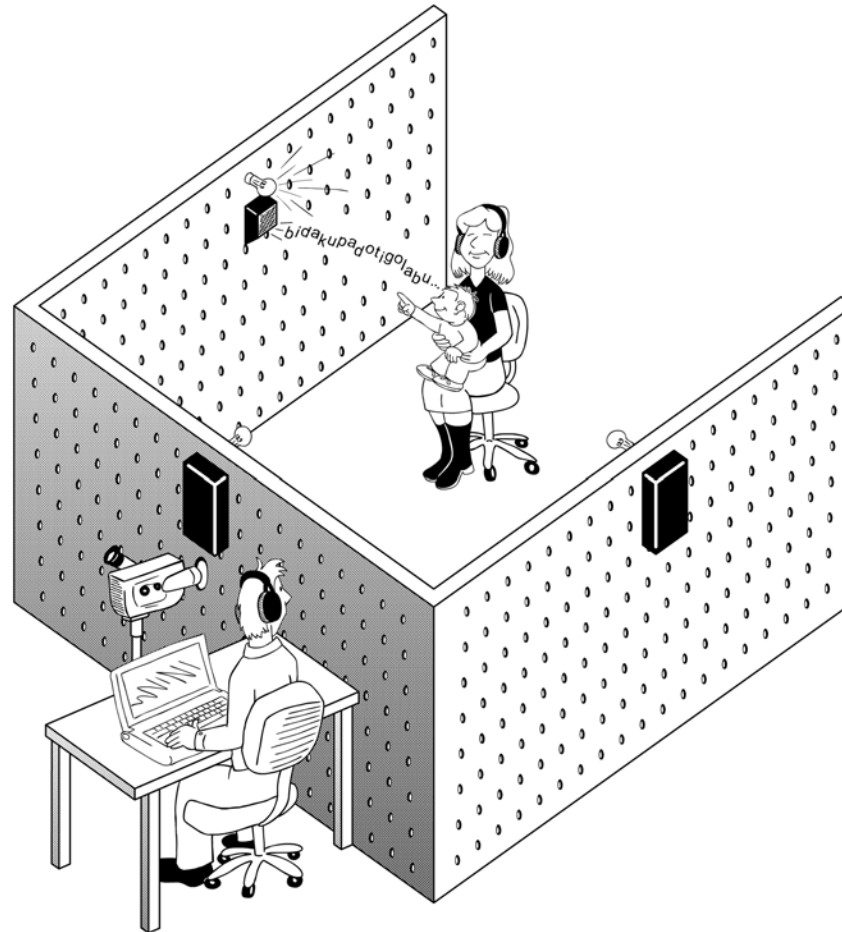


Habituation



Headturn Preference Procedure

Phonological, prosodic discrimination, segmentation



And many more !!



Baby ERP



Near Infrared Spectroscopy



Meg Imaging studies

(From Kuhl)

Revealing amazing language competencies!

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!

Consider the study conducted by Moon et al...

Moon, C., Lagercrantz, H., & Kuhl, P. K. (2012) Language experienced *in utero* affects vowel perception after birth: a two-country study. *Acta Pædiatrica*.

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!

Segmentation

How does the baby
carve up the speech stream into units?



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



High probability Low probability High probability
↓ ↓ ↓
PRE 80% TTY.02% BA 80% BY

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 of 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?



“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!

Bortfeld, H., Morgan, J. L., Golinkoff, R. M., & Rathbun, K. (2005). Mommy and me: Familiar names help launch babies into speech stream segmentation. *Psychological Science*, 4, 298-304.

Sandoval, M. & Gomez, Rl. L. (2016). Overriding the metrical bias with lexical information: English-learning 7.5-mo-olds use mommy to segment iambic words. *Language Learning and Development*,

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...

Baby has found some words...

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

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



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

6 months!



Find Mommy! Where's Mommy?

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).

Bergelson, E. & Swingley, D. (2011). At 6-9 months infants know the meaning of many common nouns. PNAS, 1-6.



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.



Language input matters from birth!



What do babies in the first 12 months know about their language?

- **Phonology, prosody, segmentation**

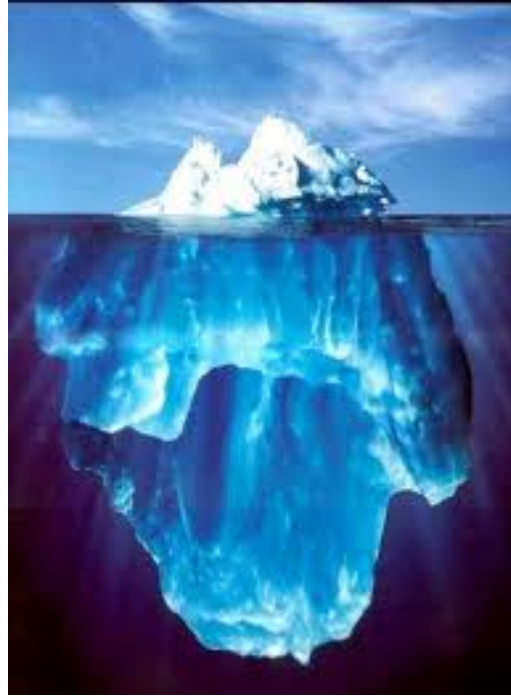
- Arrive discriminating between the world's phonemes
- Arrive having learned about vowels of their language
- 6 mo - Can find words in speech stream after own name or momma
- 6-8 mo - Can calculate statistics to find syllables that hang together
- 9 mo - Show sensitivity to native language stress patterns
- 9 mo - Use pauses in infant-directed speech, maybe to find constituents (phrases, clauses)

- **Word learning**

- 6 mo - comprehend many frequent words
- 10 mo – learning 2 new words at one sitting; little attention to social cues

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

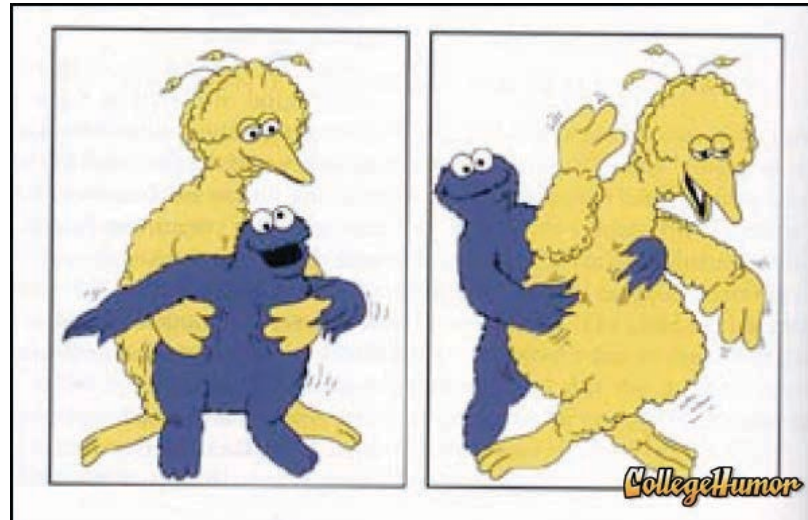
But...



Do babies also know something about *grammar*?

Grammar – *is all about pattern detection*

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!

Babies are so NOT vegetables!



Anne Geddes

Part III. How does language develop?

nexus

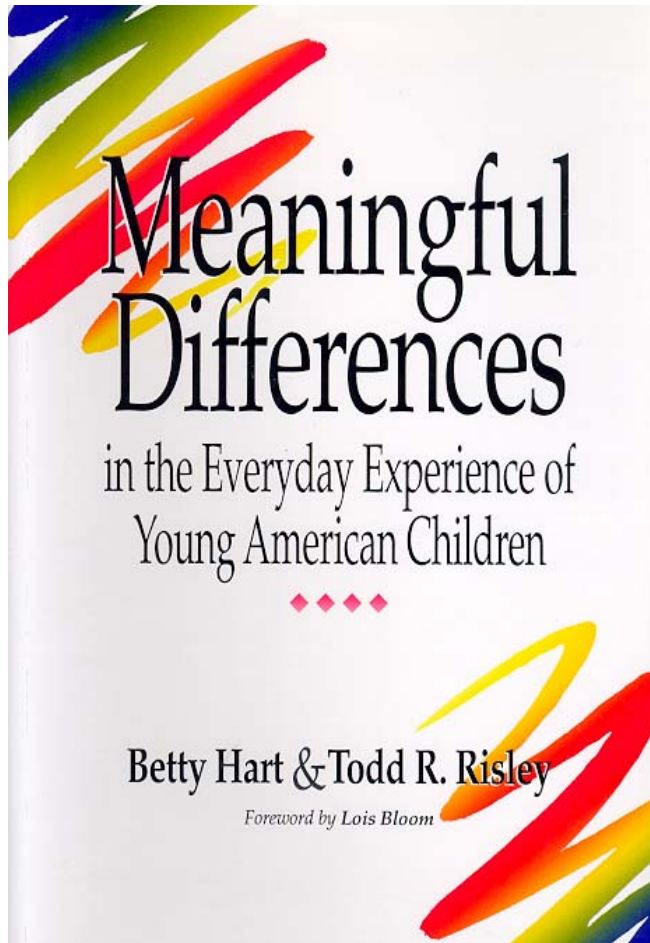
of social interaction between children and
caring adults.

But what is it about that interaction that fuels
language development?

Quantity or Quality?

Role of new technology?

Our work on early language started with Hart and Risley (1995)



Number of words heard per hour:

Welfare - 616

Working Class - 1,251

Professional - 2,153

This is the **30 million word gap** and it has a **number of far reaching consequences:**

At age 3, children's vocabulary size?

Professional - 1,116

Working Class - 749

Welfare - 525

And...

- Verbal IQ correlates with school achievement
- Reading is parasitic on language
- Language encodes concepts!
- Language skill predicts health care outcomes



But is it all about *number of words* that pass children's ears?

Given the latest interventions, you might think so...



But Hart and Risley (1995) also said that is it not just quantity! Parent talk that is *contingent and responsive* to child talk is more important than just number of words – quality counts too! (Tamis LeMonda et al., 2014; Dunham & Dunham, 1996; Hart & Risley; Mol & Newuman, 2014).

Sometimes that message gets lost in popular translation

STUDY: We asked two questions:

1. Do low-income children who are successful language learners experience a higher quality of communication than their less able peers?
2. How important is the *quantity* of language children hear relative to the *quality* of the communication foundation?

Adamson, Bakeman, Deckner, & Nelson, 2012; Aksan, Kochanska, & Ortmann, 2006; Hirsh-Pasek, Adamson, Bakeman, Owen, Golinkoff, Pace, Yust, & Summa, 2015).

Psychological Science.

Examining the Quality and Quantity of Communication during parent-child interaction



High language scores

Mid language scores

Struggling language scores

N = 60 low-income children

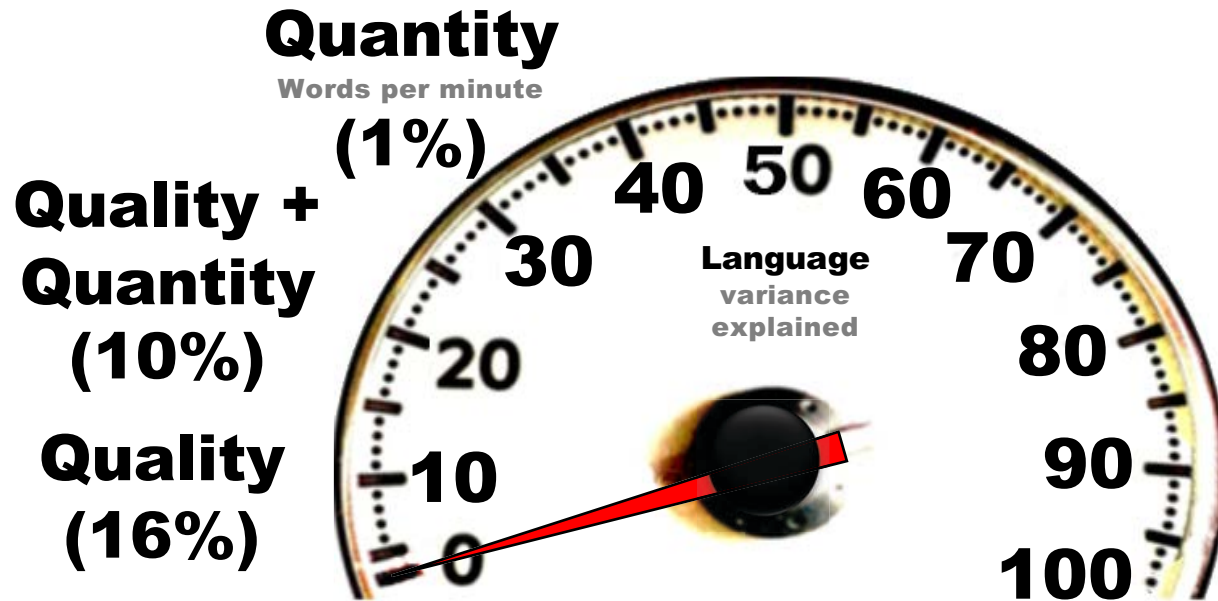


Quality =

- 1) Symbol infused joint engagement (gesture and words)**
- 2) Fluid and connected exchanges (verbal and non-verbal)**
- 3) Playful routines and rituals**

Quantity = number of mother's words per minute

Findings and Implications



- 1. Quantity of input (amount) and Quality of Foundation for Communication are both important for language growth but “communication foundation” matters more.**
- 2. In our study, it’s not about poverty; all dyads were low SES!**
- 3. Fluid and connected conversations – “Conversational duets” require serve and return, and return and return and return. ...it can’t be a solo performance.**
- 4. It’s “filling the gap” + “building the foundation” – a new metaphor for intervention**

Conversational duets

-in which what the adult says and does is ***CONTINGENT on the child's focus***
are the interactions that fuel language growth
and likely fuel attention and the ability to engage at
school



When do these interactions occur? During play and daily life activities!

Any neurological evidence that supports these behavioral findings?



- **Romeo et al:**

- During a story-listening functional MRI task, children who had experienced more conversational turns with adults— independently of SES, IQ, and adult-child utterances alone (language quantity)—exhibited greater left inferior frontal (Broca’s area) activation”
- What mattered? # of conversational turns!
- What is it about conversational turns that matters?
 - These are contingent on what the child says and does

Romeo, R. R. et al.. (2018). Beyond the 30-million-word gap: Children’s conversational exposure is associated with language-related brain function. *Psychological Science*.

So if contingency is important, should we get language learning from TV? From SKYPE?

Study: Taught children (30-42 months) novel verbs

Findings?

Live interaction	➡	Learning occurred
Live + video	➡	Learning occurred
Video only	➡	<i>No learning occurred <36 mos.</i>



Babies and toddlers learn best from live interaction!
“Video deficit” below 30 months

Anderson & Hanson (2013), for a review

Troseth and colleagues

Roseberry, S., Hirsh-Pasek, K., Parish-Morris, J., & Golinkoff, R. M. (2009). Live action: Can young children learn verbs from video? *Child Development*, 80, 1360-1375.

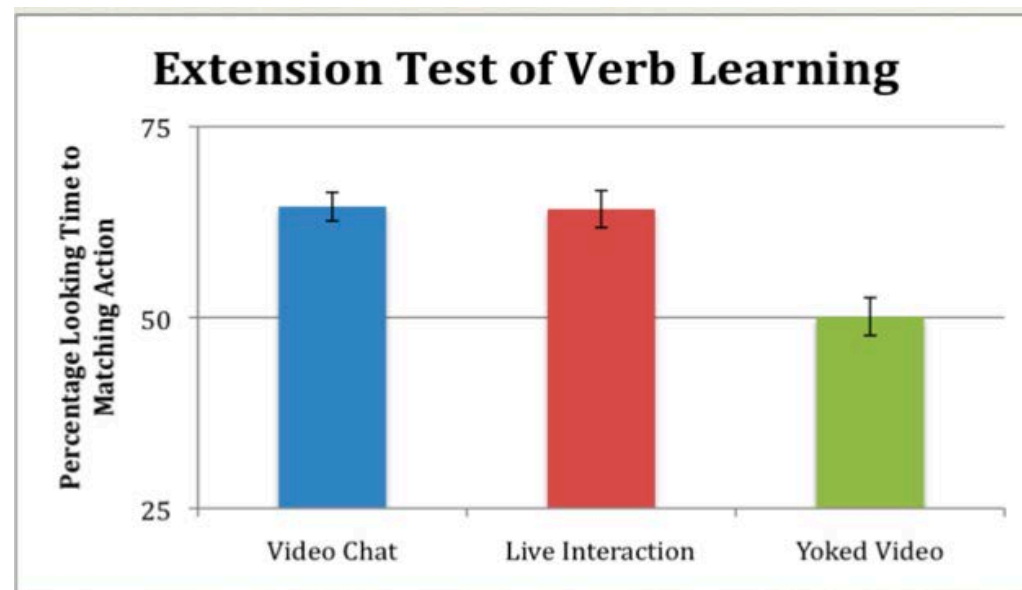
From SKYPE? How did children respond to video chats compared to live interactions?

Skype: Flat, 2-dimensional like TV
Unlike TV, contingent responding



Sarah
Roseberry

Learning from video chats was more like LIVE than like TV



Roseberry, S., Hirsh-Pasek, K., & Golinkoff, R.M. (2014) Skype me! Socially contingent interactions help toddlers learn language. *Child Development* 57

Contingent responses enable word learning – even over Skype!

- But what happens if we disrupt the contingency?
- Random cell phone calls and text messages disrupt contingent conversation!

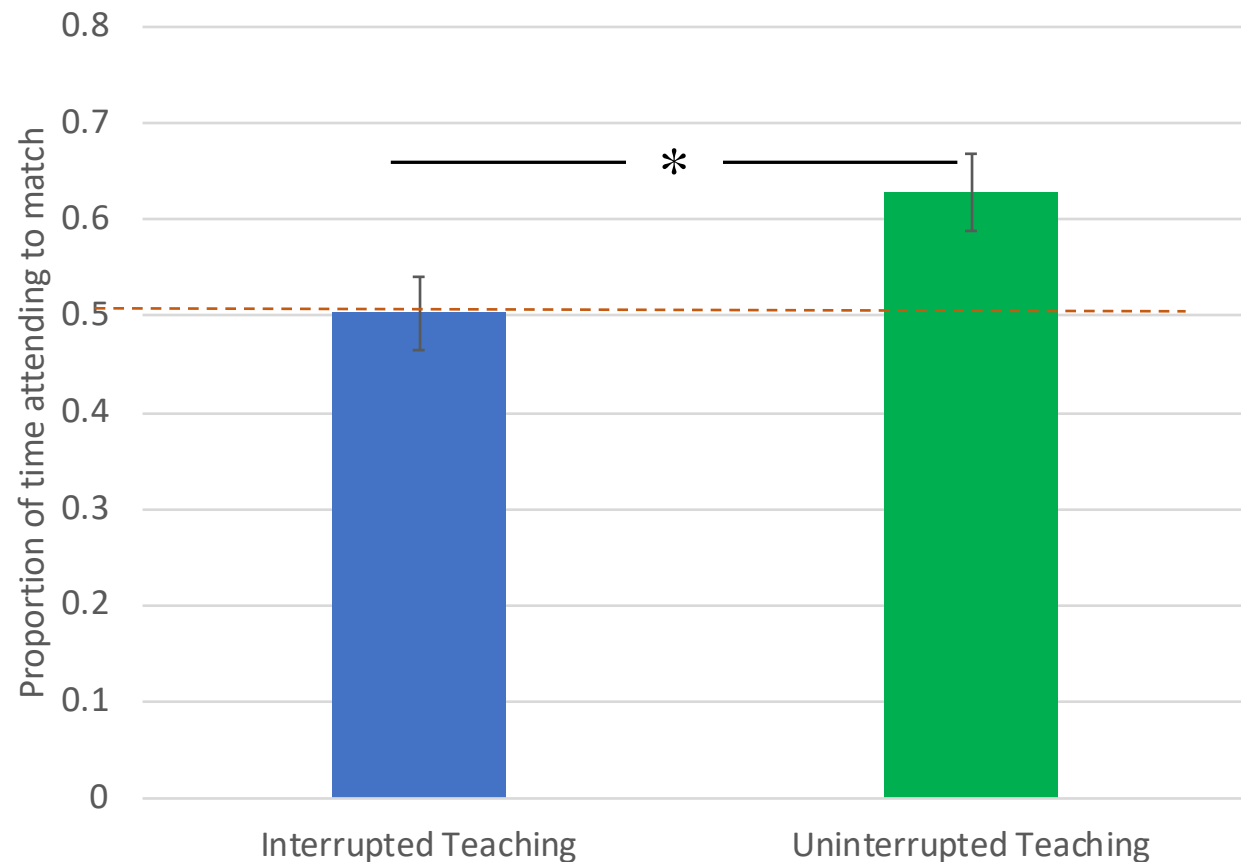
Do these interruptions derail children's word learning?



Do interruptions affect word learning?



**Jessa
Reed**



Reed, J., Hirsh-Pasek, K., & Golinkoff, R. M. (In press) Learning on hold: Cell phones sidetrack parent-child interactions. *Developmental Psychology*.

Part III. Summary: **Contingency matters!**

- Two studies show contingency matters in:
 - Conversational duets in vivo
 - Over Skype
- A third study turned this on its head:
 - Violate that contingency → disrupt language learning
- When do conversation duets with contingent interaction occur?



During good old fashioned every day...



Part IV. Improving language for all children:

All kids need quantity and quality input

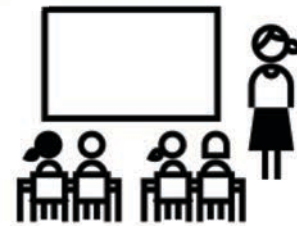
How to improve the language trajectory for all children – but especially those from low income families?

Some examples of language change at the:

Individual level



The classroom level



The community level





At the individual level...

Developed a screener so that kids (ages 3 through 5) don't languish in classrooms!

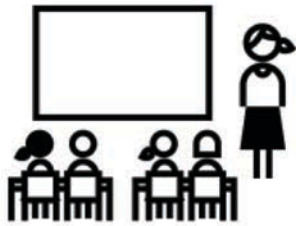


Tablet-based and kids love taking it!
Anyone can give it!

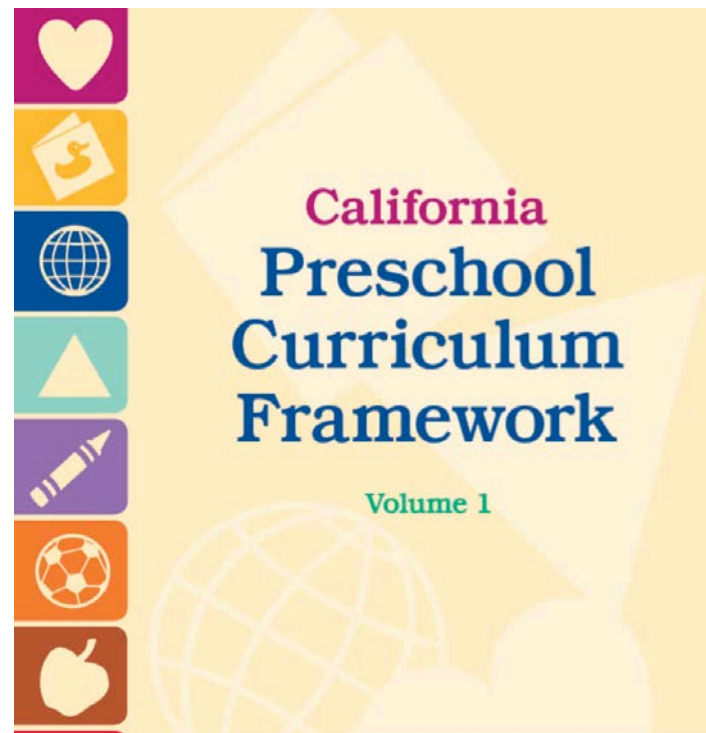
We tested over 1000 children of varied SES around the country for monolingual English and bilingual Spanish-English versions

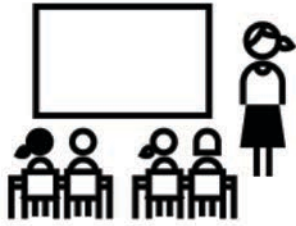
	PRODUCT	PROCESS
VOCAB	KNOWN NOUNS	
	KNOWN VERBS	FAST MAPPING NOUNS
	PREPOSITIONS	FAST MAPPING ADJECTIVES
	CLAUSAL CONNECTORS (e.g., <i>after</i>)	
GRAMMAR	WH-QUESTIONS	
	PAST AUXILIARY AND COPULA (e.g., "Where <i>was</i> the hat?")	SYNTACTIC BOOTSTRAPPING OF NOVEL VERBS
	PREPOSITIONAL PHRASES	CONVERTING ACTIVE TO PASSIVE (e.g., "Who got <i>koobed</i> ?")
	EMBEDDED CLAUSES	

Brookes Publishing brought out English version; bilingual Spanish-English due out in Fall!



Classroom Level – we created a set of 6 principles for growing language in the classroom





Can what goes on in the classroom or day care build language development?

Absolutely!

But not with “drill and kill”! We want



See Vernon-Feagans: Poor, rural children gained in language IF a caregiver talked to them in positive tones as individuals

What are the principles that promote language learning in home, school, or day care?

The 6 principles for language learning

1

Children learn what they hear most (kids calculate statistics)

2

Children learn words for things and events that interest them

3

Interactive and responsive environments build language learning (Contingency - your role!; not media)

4

Children learn best in meaningful contexts (e.g., link to their lives)

5

Children need to hear diverse examples of words & language structures (don't avoid full sentences)

6

Vocabulary and grammatical development are reciprocal processes (build on each other, e.g., *blork*)

Harris, J., Golinkoff, R. M., & Hirsh-Pasek, K. (2011). Lessons from the crib for the classroom: How children really learn vocabulary. In S. B. Neuman & D. K. Dickinson (Eds.) *Handbook of early literacy research*, Vol. 3 (pp. 49-65). NY: Guilford Press.



Community Level

Empower parents to be agents for their children's language development!

Language starts early and parents really matter
Strong language skills are a life long asset!

- **But many parents do not know this!** Use slogans, e.g., *Talk is cheap so spend tons of it on your kids!*
- **Encourage talking WITH babies - start by narrating daily activities**
- **Strive for Five!**
- **Encourage parents to talk WITH their children – suggest topics and even words they might use!**





In our labs, we are also experimenting with a new way to spur language development: by *disseminating experiences that prompt quality talk!*



In collaboration with Brenna Hassinger-Das, Andres Bustemante, Molly Schleisinger and Brookings Institute





The idea?

- To marry the learning sciences with architectural design in public spaces in ways that create playful learning opportunities for families and children
- To naturally increase the quality of the caregiver-child interaction in ways that sparks cognitive and social development through play!



Example 1: The Ultimate Block Party

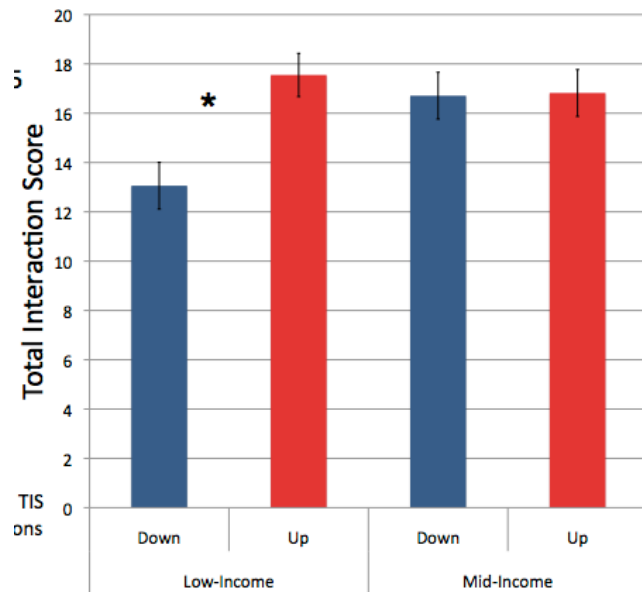
- 28 science inspired activities in Central Park, NY in 2010
- Over 10 million people reached; 50,000 at event itself!
- RESULTS: increase in parents' attitudes to the play-learning connection, which is a vital component in public awareness.



Example 2: The Supermarket Study



RESULTS?



Supermarket projects:

Tulsa, South Africa, Ohio

Ridge, Ilgaz, Weisberg, Hirsh-Pasek & Golinkoff (2015).
Mind, Brain, and Education.

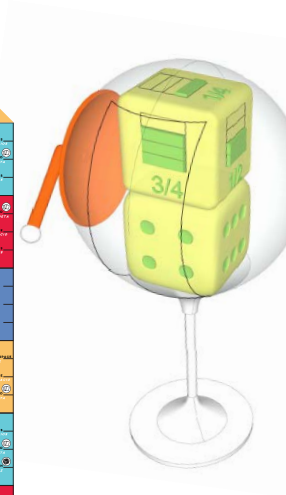


Example 3: Parkopolis

- The Human Sized Board Game designed to foster early mathematical skills and scientific reasoning. Compared observations to another STEM, rocket building, activity at the museum

RESULTS (N= 111)

- Parent-child interaction compared to control
- Adult and child language use and question use
- **Targeted spatial/numeric language and fraction language**
- Physical activity



Thanks to Fei Xu, Silvia Bunge and all of our mathematic colleagues!

CONCLUSION: Children need to do some heavy lifting to learn language but if we help them with conversation 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



Dr. Kathy Hirsh-Pasek

Thanks for listening!

