

Beyond Early Intervention: Supporting Deaf Children Through Elementary School

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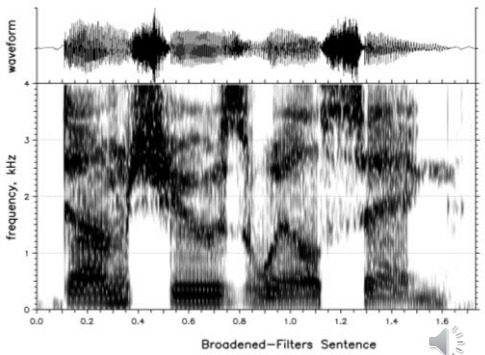
Supported by grants R01 DC000633 and R01 DC006327
National Institute of Deafness and Other Communication Disorders

Why is it so hard for a deaf child to learn language?

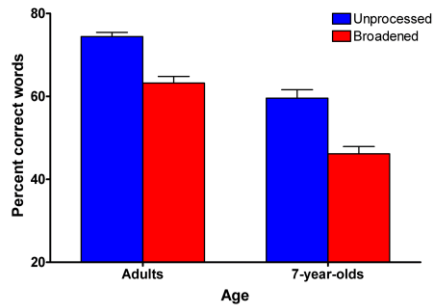
Even if the child does have cochlear
implants

– or *especially* if the child has implants

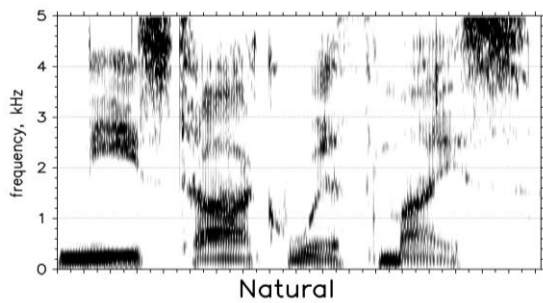
Broadened Filters



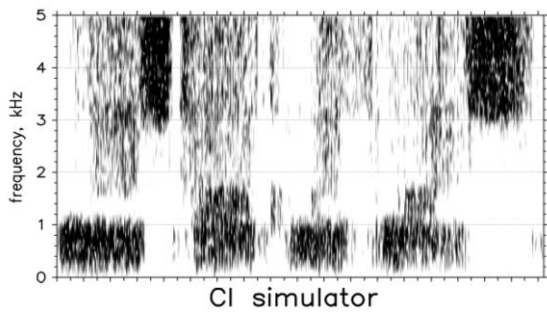
Sentence Recognition in Noise



Speech Perception & Implants

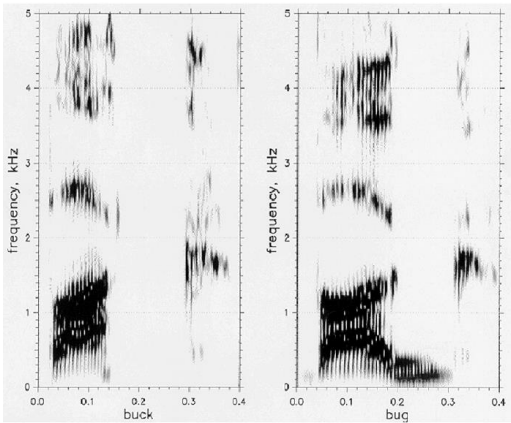


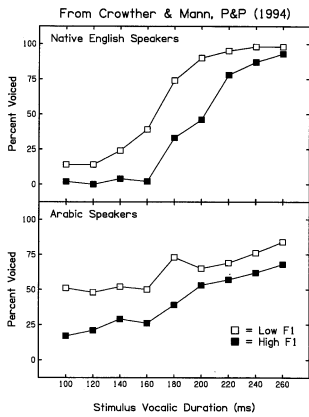
Where have all the cues gone?

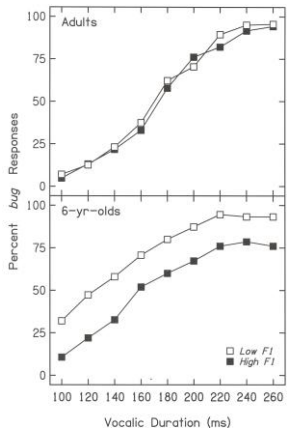


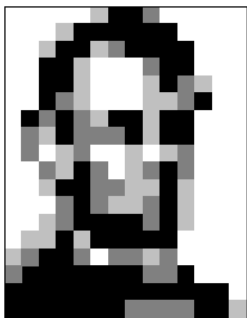
What must the child learn to do?

- What signal components to pay attention to.
- How to organize those signal components.









**Status of Language
Performance of Deaf Children**

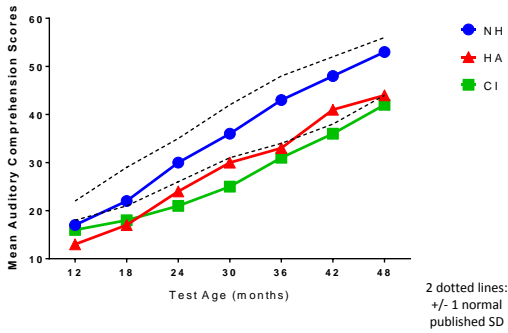
Our Sample Size - Preschool

• 202 children

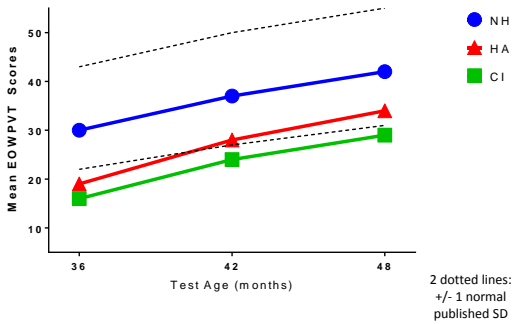
NH No	NH Signs	E-HL No	E-HL Signs	L-HL No	L-HL Signs
53	33	47	28	26	15

	early	late
HA	25	13
CI	50	28

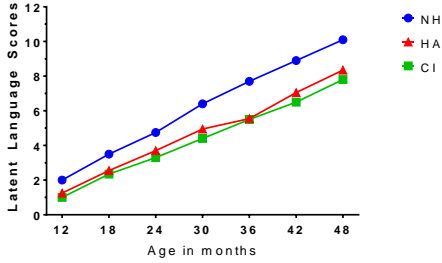
Auditory Comprehension



Expressive Vocabulary



Development of Latent Language Scores

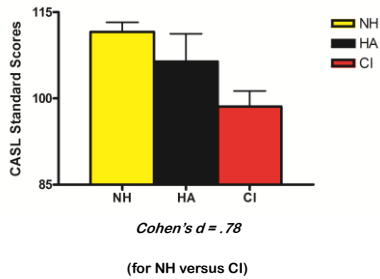


Participants in Second Grade

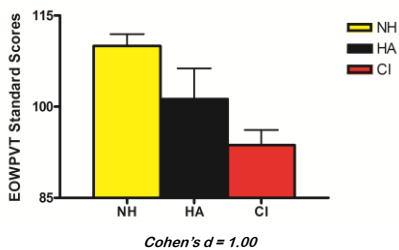
- 49 children with normal hearing
- 19 children with moderate-severe hearing loss who wear hearing aids (mean better ear PTA = 69 dB HL)
- 56 children with profound hearing loss who wear cochlear implants

39 bilateral implants

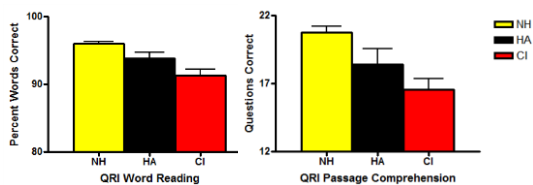
Auditory Comprehension



Expressive Vocabulary



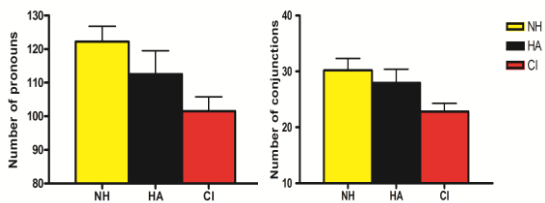
Reading Outcomes



Cohen's $d = .88$

Cohen's $d = .88$

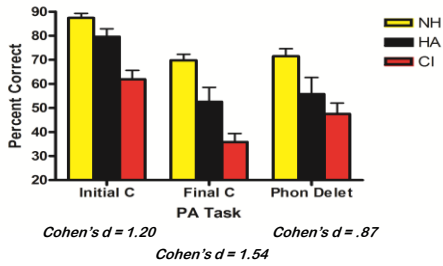
Productive Syntax



Cohen's $d = .65$

Cohen's $d = .56$

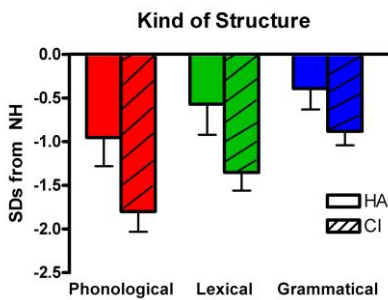
Phonological Awareness



Factor Analysis

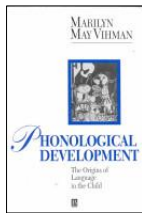
	Phonological	Morphosyntactic	Lexical
Initial Consonant Choice	.737	.097	.438
Final Consonant Choice	.755	.182	.203
Phoneme Deletion	.742	.102	.411
Expressive Vocabulary	.409	.086	.772
Auditory Comprehension	.257	.253	.800
Reading Comprehension	.305	.294	.800
Word Reading	.673	.065	.394
Reading Fluency	.376	.144	.737
Working Memory	.729	.103	.121
Number Different Words	.047	.841	.334
Mean Length Utterance	.087	.798	.305
Number Conjunctions	.119	.910	.005
Number Pronouns	.180	.776	.063

Mean Latent Scores at 2nd Grade



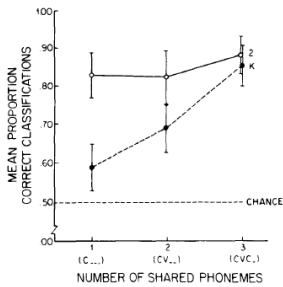
Acquisition After Starting School

Child Phonologists Agree

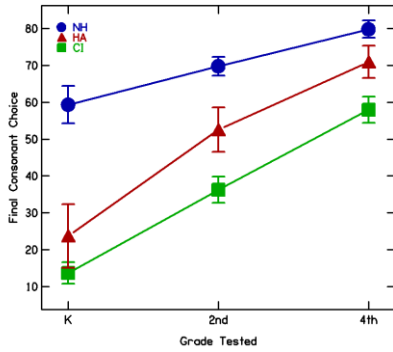


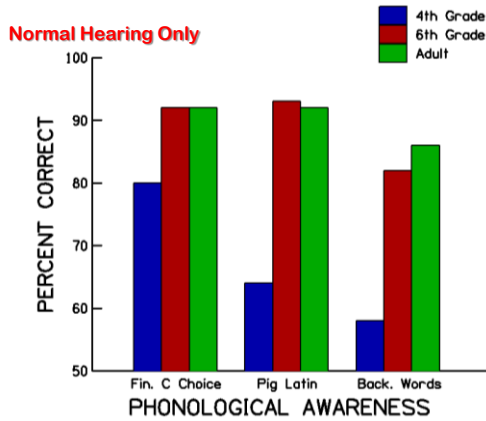
The word or syllable is the first unit of linguistic organization for the child.

...the segment emerges as an independently controlled element only in later childhood, well after the preschool years. (page 2)



Walley, Smith, & Jusczyk, 1986, Mem&Cog, 220-229.





Embedded Clauses

The young girl chased the happy puppy.
 The young girl pushed the old man.

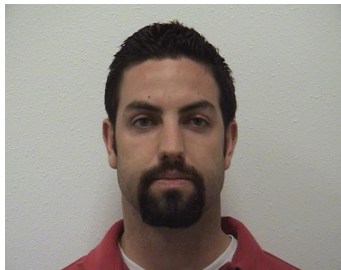
The young girl who pushed the old man
 chased the happy puppy.

Designing School- Age Intervention

Enrich the Signal

- Keep background noise to a minimum
- Acoustically treat the classroom(s)
- Use a good FM system
- Other, more involved methods

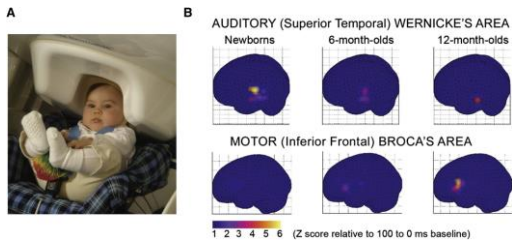
Add visual signal



Use Only Speech Signals



Speech Signals are Organized Differently from Non-speech



From Kuhl, 2010, Neuron

Encourage Generative Language

	5 worst CI users	5 best CI users
Open-ended questions	12	26
Directives ("Say ___")	40	21
Explanations	22	49
Recasts	2	8

Parental Language Styles

Direct Instruction of Vocabulary & Syntax

- ✓ Pre-teach vocabulary for each subject
- ✓ Teach age-appropriate vocabulary
- ✓ Group story writing
- ✓ Sentence combining activities
- ✓ Transcription

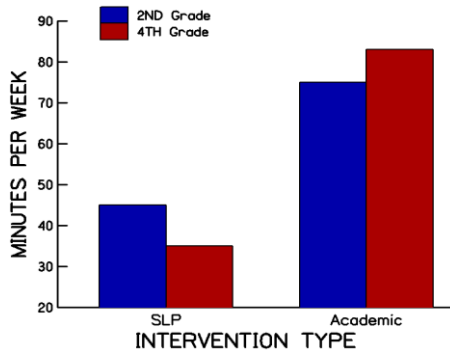
Phonological Awareness Training

- ✓ Orton-Gillingham-like approaches
- ✓ Other phonological awareness materials
- ✓ Phonics reading approaches
- ✓ Pronunciation guides (e.g., “Angling for Words”)
- ✓ Spelling practice

Diagnostics and Keeping Track

- Instruments that specifically assess:
 - Phonological sensitivity
 - Grammatical abilities
 - Expressive vocabulary
- Nonword repetition
- Rapid Automatic Naming
- Working Memory; specific to phonological structure

Amount of Intervention



The Summary

- Early identification and intervention have improved the readiness of children with hearing loss to start school in mainstream settings
- But they are still behind at the start
- There is much language learning that goes on after children start school
- Greater intervention is required for children with hearing loss after they start school
