

How Extended High-Frequency Amplification Affects Word Learning in Children

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Background

- Combination of two previous studies
 - Bandwidth and perception
 - Word learning and hearing loss

- Purpose
 - To determine the affect of bandwidth on word learning in normal-hearing and hearing-impaired children
 - Standard bandwidth - 4 kHz
 - Extended bandwidth - 9 kHz

Novel-Word Construction

Manner

		Place							
		Bilabial	Labio-dental	Dental	Alveola	Post Alveola	Palatal	Velar	Glottal
Plosive		p b			t d			k g	
Nasal		m			n			ŋ	
Fricative			f v	θ ð	s z	ʃ ʒ	ç ʝ		h
Approximate					r		j		
Lateral Approximate		w			l				

Novel-Word Construction

p b

t d

k g

m

n

ŋ

f v

θ ð

s z

ʃ ʒ

ç ʝ

h

r

j

w

l

Novel-Word Construction

b a i r I l

v o j I ŋ

j u ʒ æ p

z i k I n

d i w I m

t a i ð u s

θ o g I ʃ

h u ç I f

Novel-Word Construction

bayrill

vojing

youzzap

zeekin

deewim

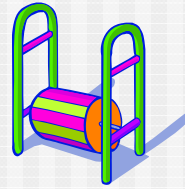
tathus

thogish

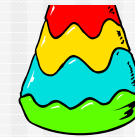
hoochiff

Novel-Word Construction

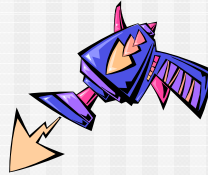
bayrill



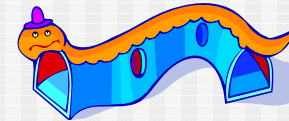
vojing



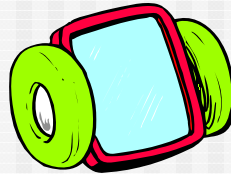
youzzap



zeekin



deewim



tathus



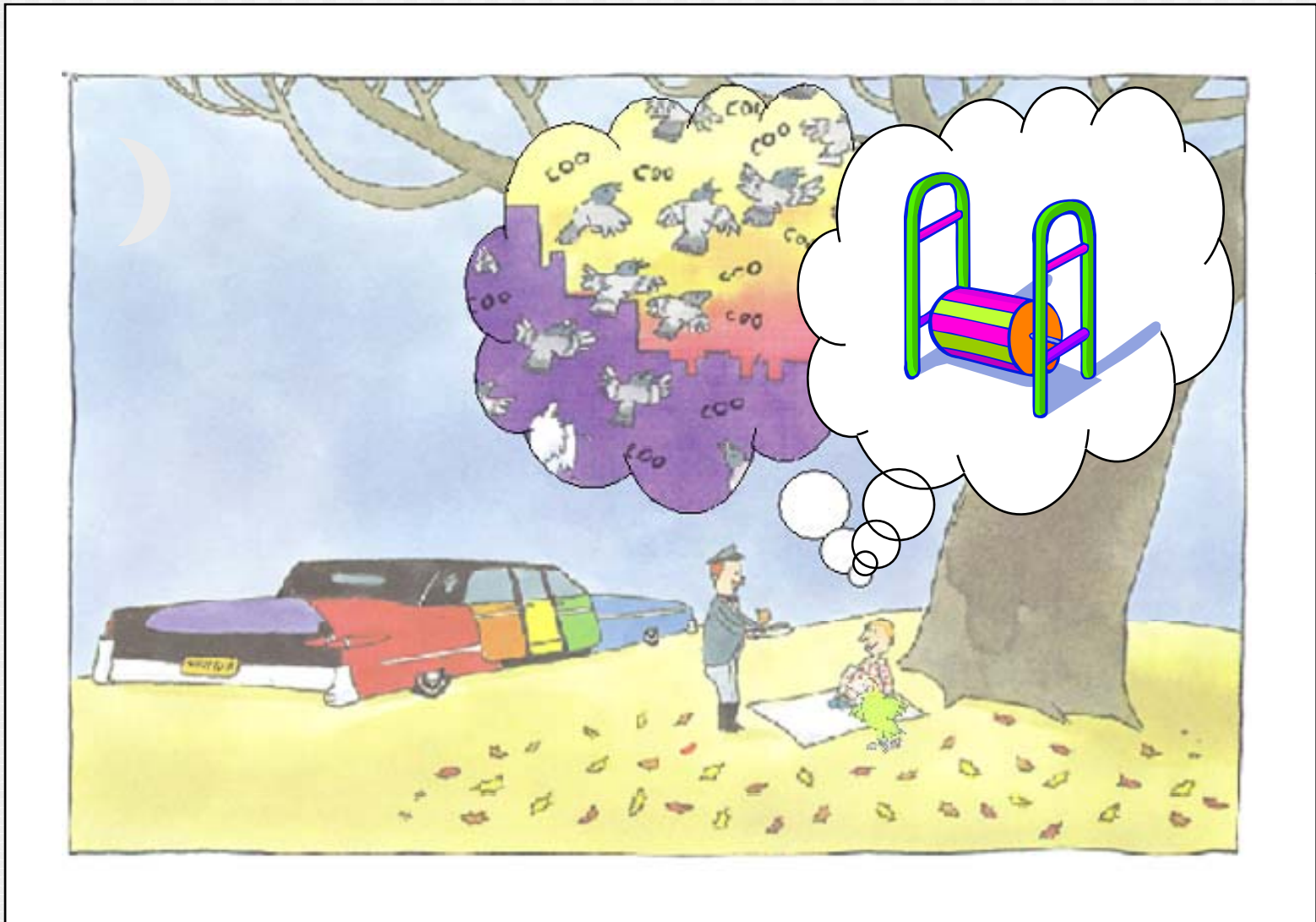
thogish



hoochiff



Story Construction



Filtering

- Low-pass filtered the words at 4 & 9 kHz

4 kHz

bayrill
youzzap
deewim
thogish

9 kHz

vojing
zeekin
tathus
hoochiff

Filtering

- Low-pass filtered the words at 4 & 9 kHz
 - Created two stories

4 kHz

bayrill
youzzap
deewim
thogish

9 kHz

vojing
zeekin
tathus
hoochiff

Filtering

- Low-pass filtered the words at 4 & 9 kHz
 - Created two stories
 - Presented to separate groups of children

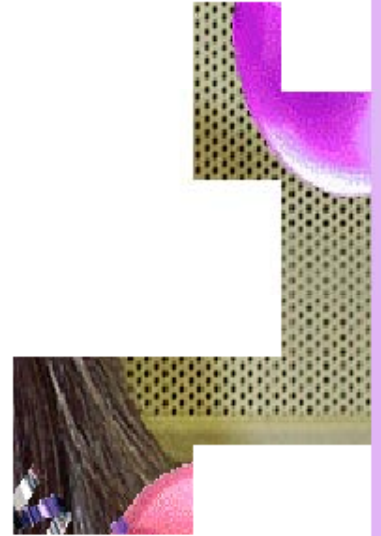
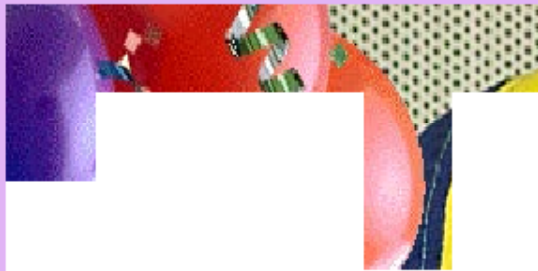
	4 kHz	9 kHz	
Story 1	bayrill youzzap deewim thogish	vojing zeekin tathus hoochiff	Group 1
Story 2			Group 2

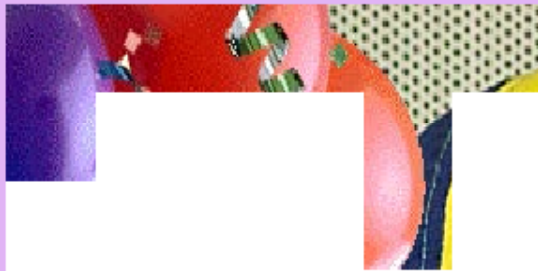
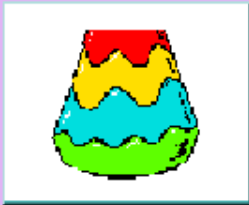
Story Presentation

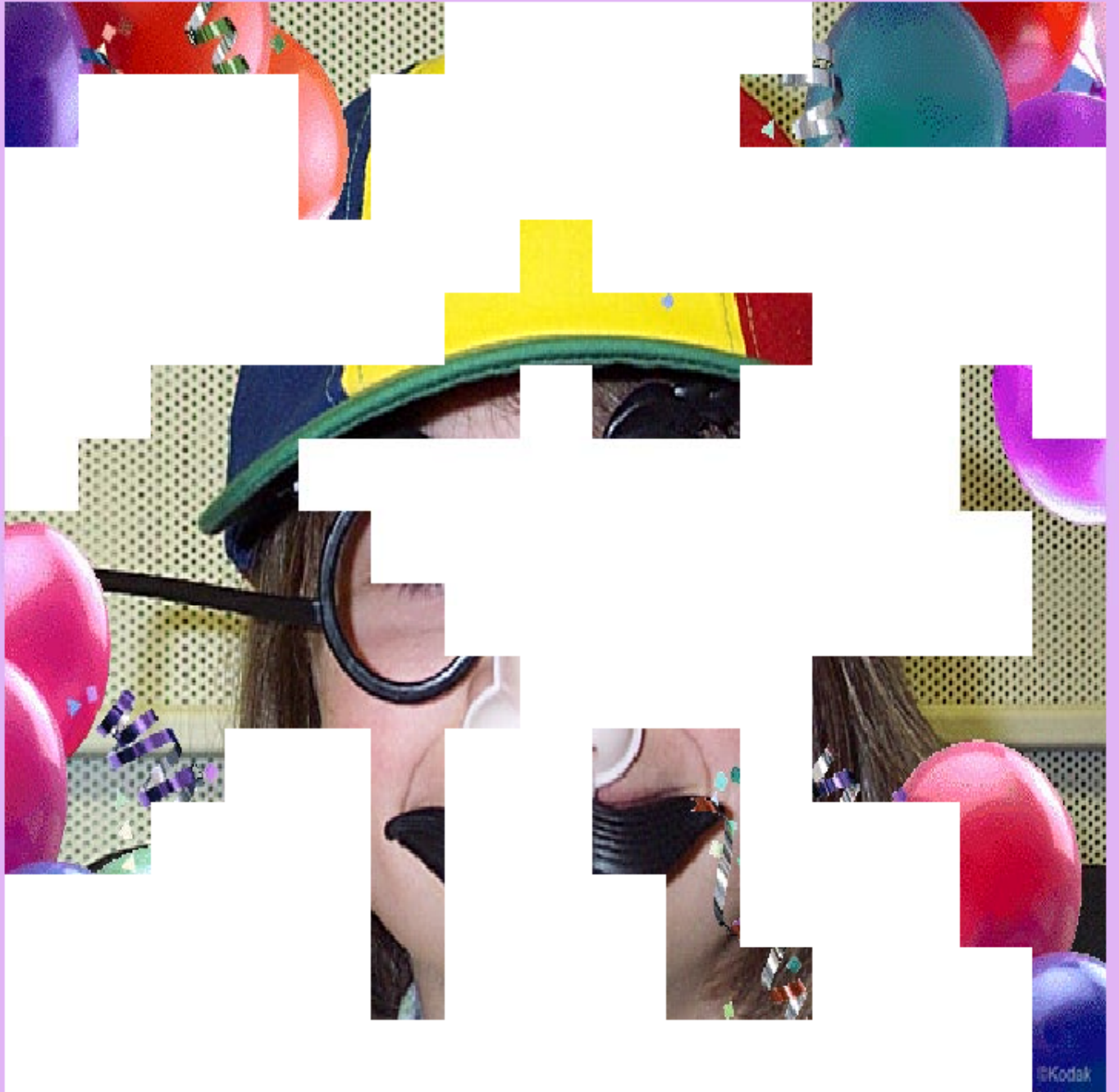
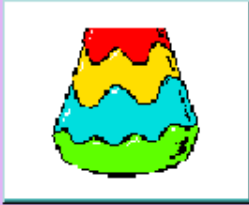
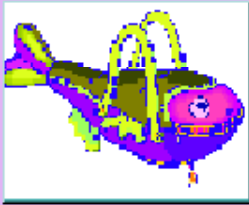
- Low-pass filtered half the words at 4-kHz and half at 9-kHz
- Each word was presented 3 times
- The 4-minute story was presented twice before testing
- Word-learning parameters
 - 8 words
 - 6 presentations each
 - 8 minute period









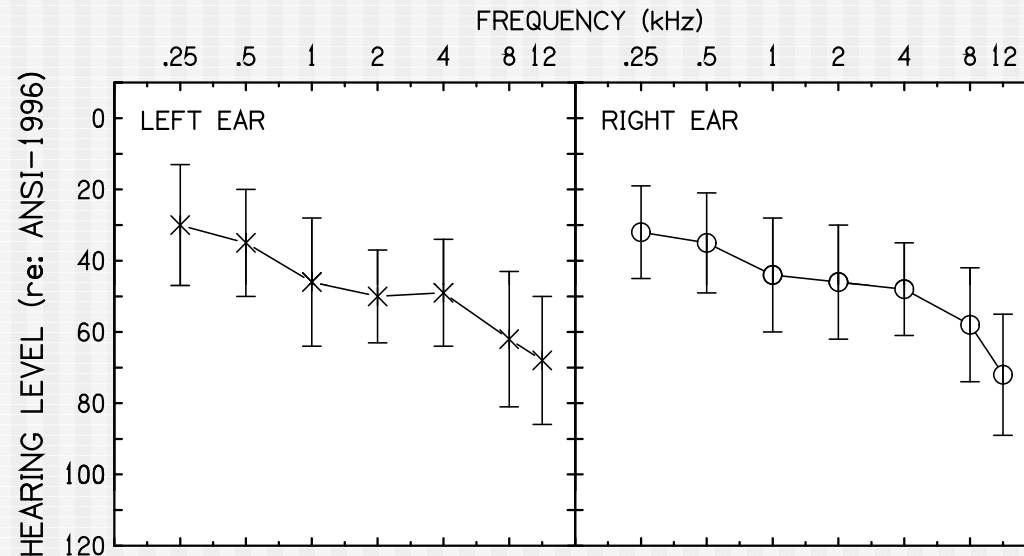






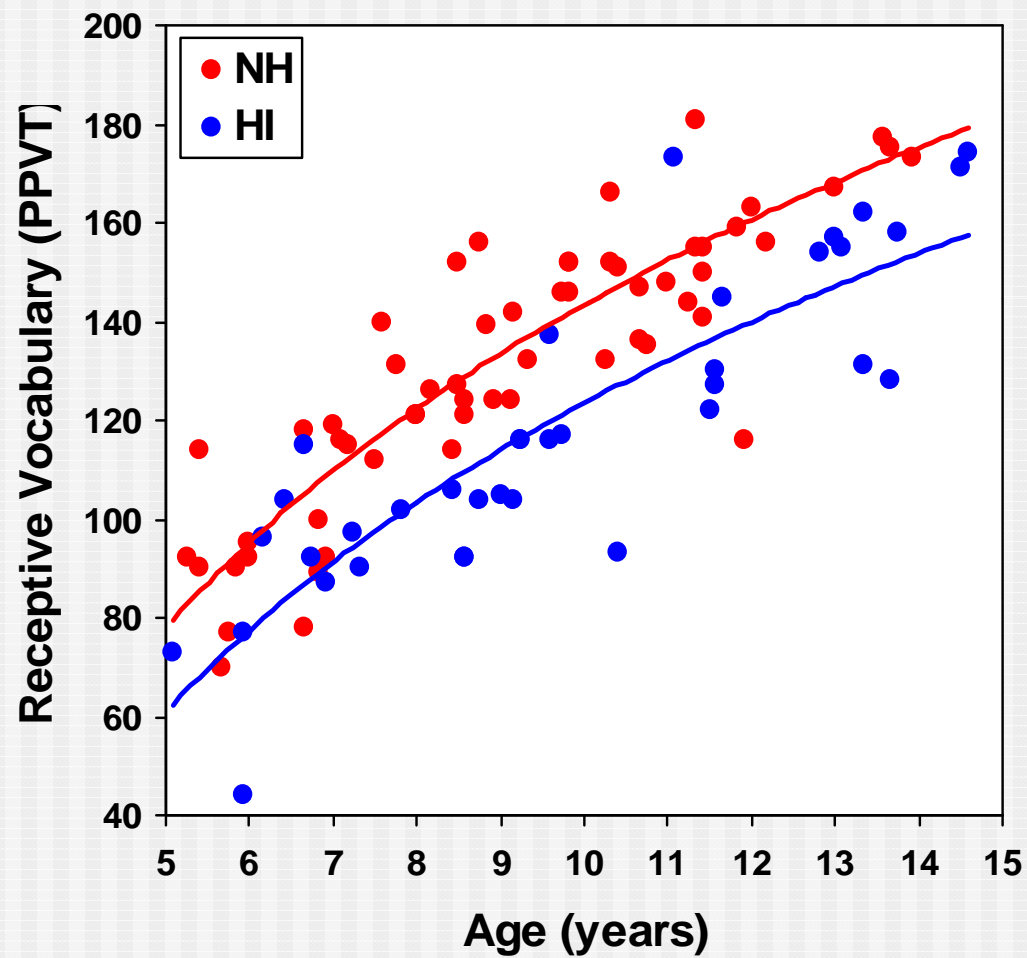
Participants

- 97 Children between 5- and 14-years-old
 - 60 Normal Hearing (mean age: 9yrs, SD: 2yrs)
 - 37 Hearing Impaired (mean age: 9yrs, SD: 2yrs)

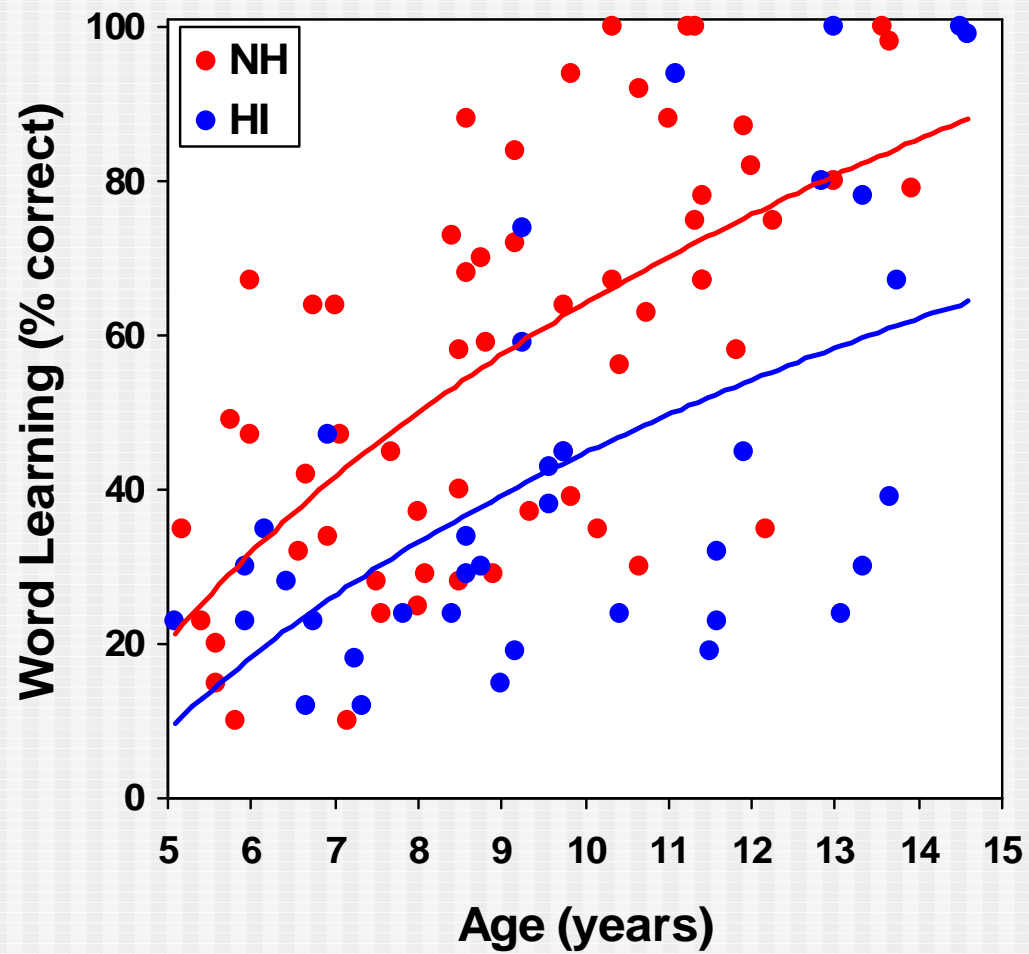


- Estimated receptive vocabulary (PPVT III)

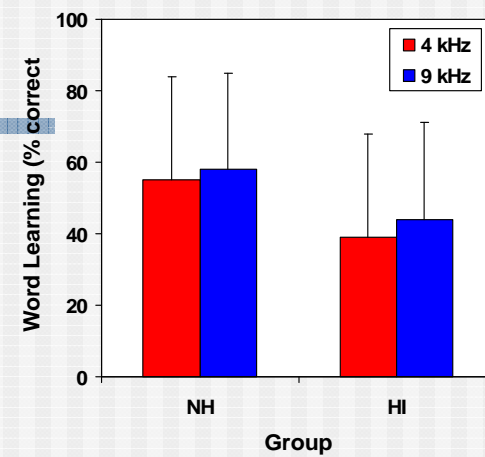
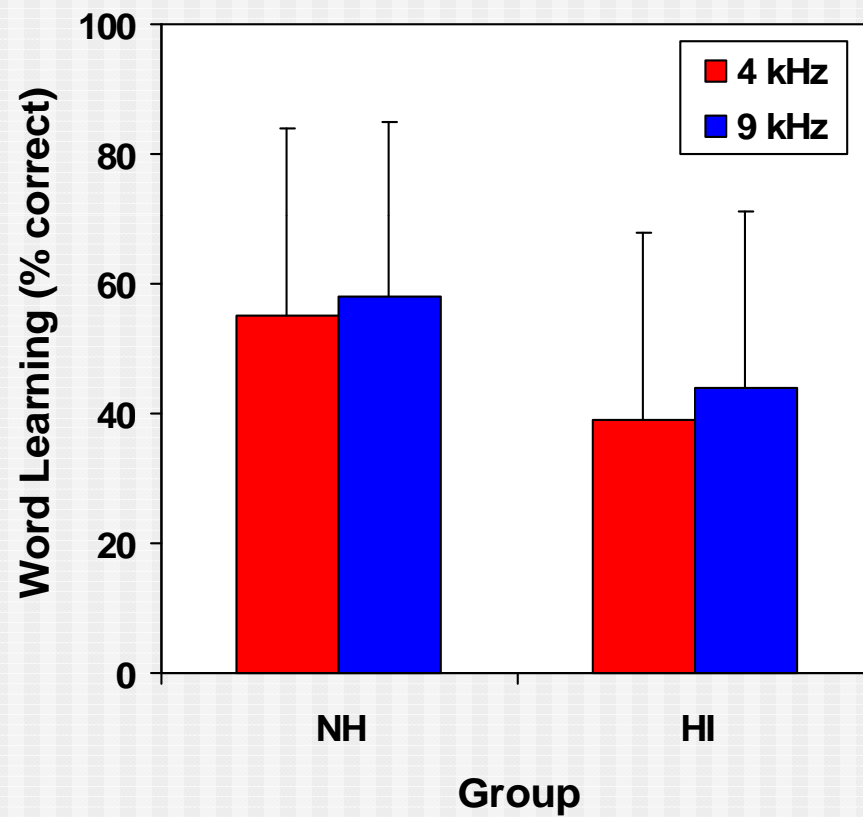
Results



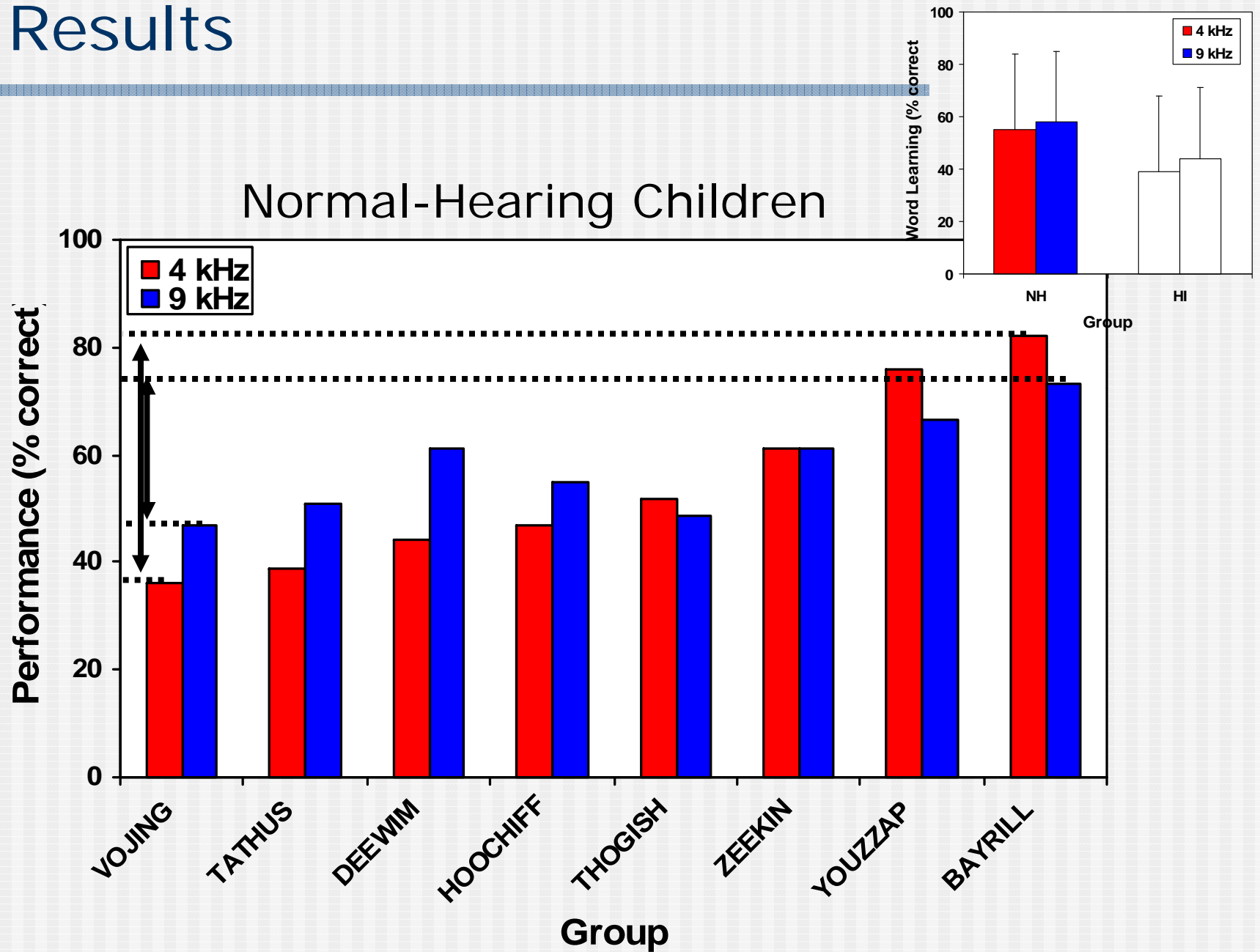
Results



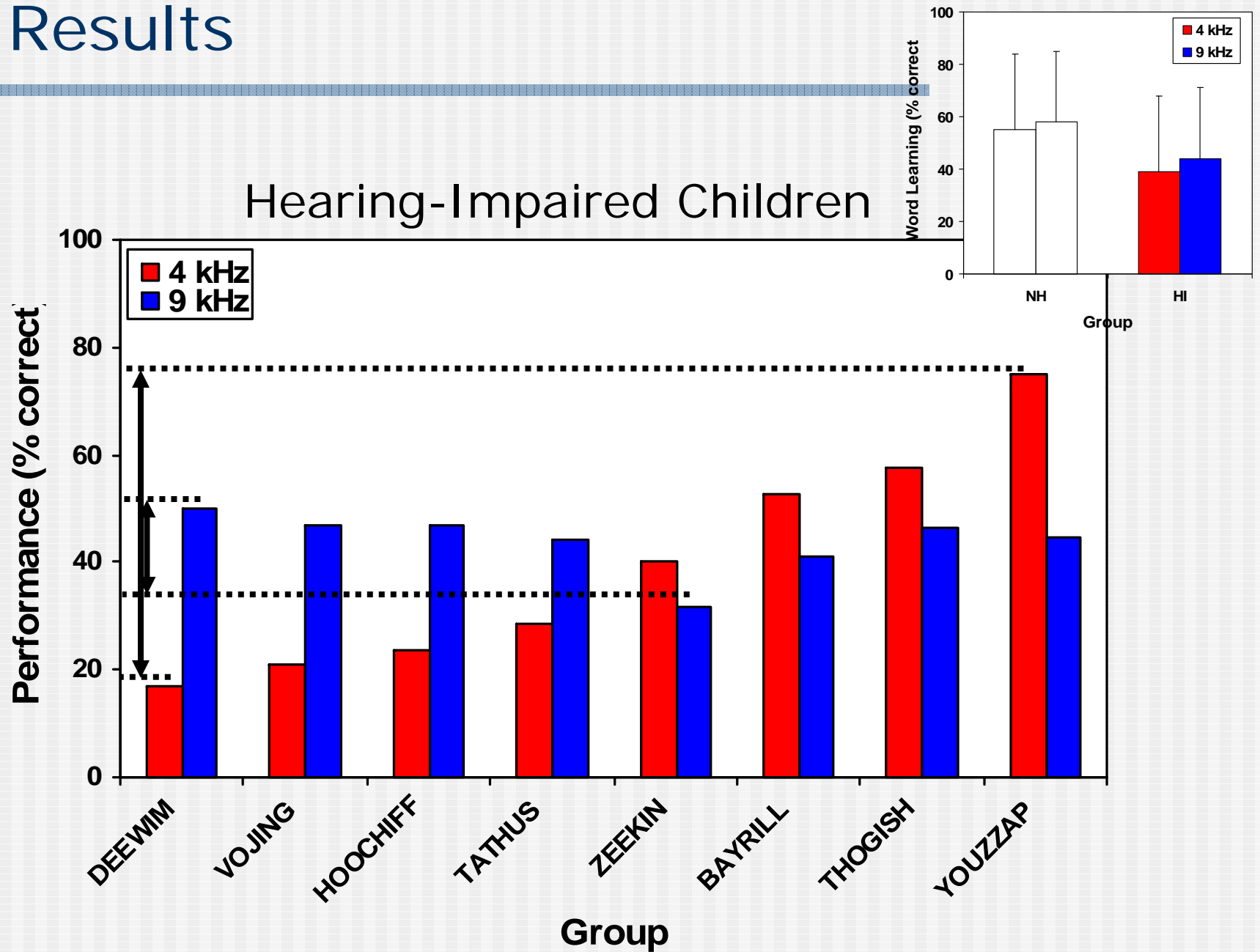
Results



Results



Results

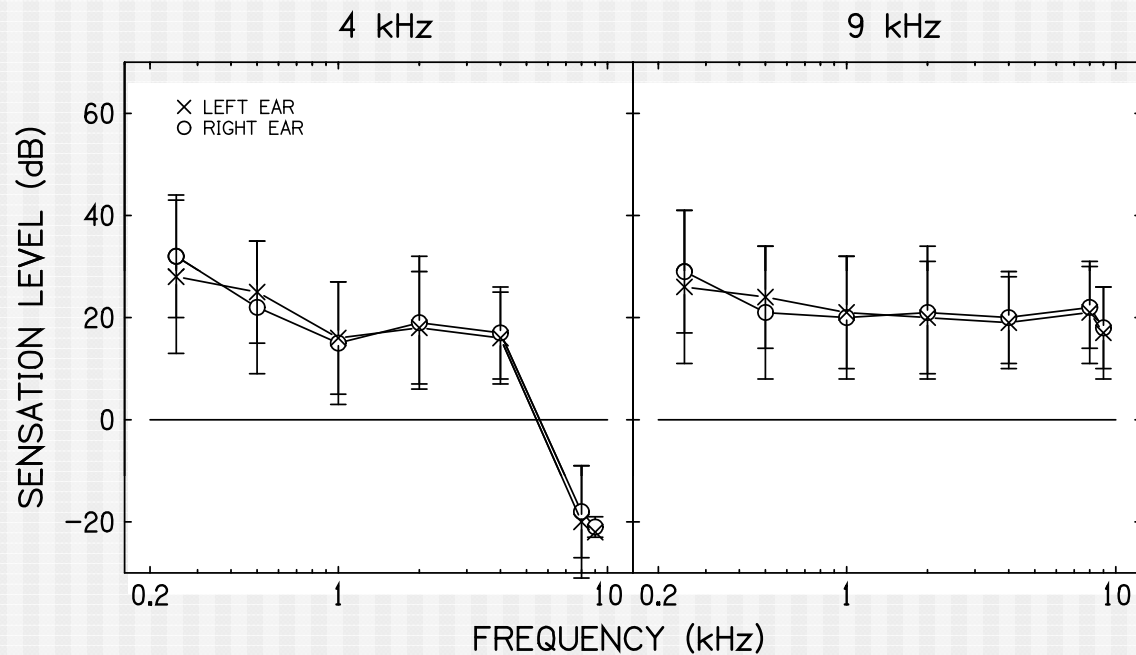


Conclusions

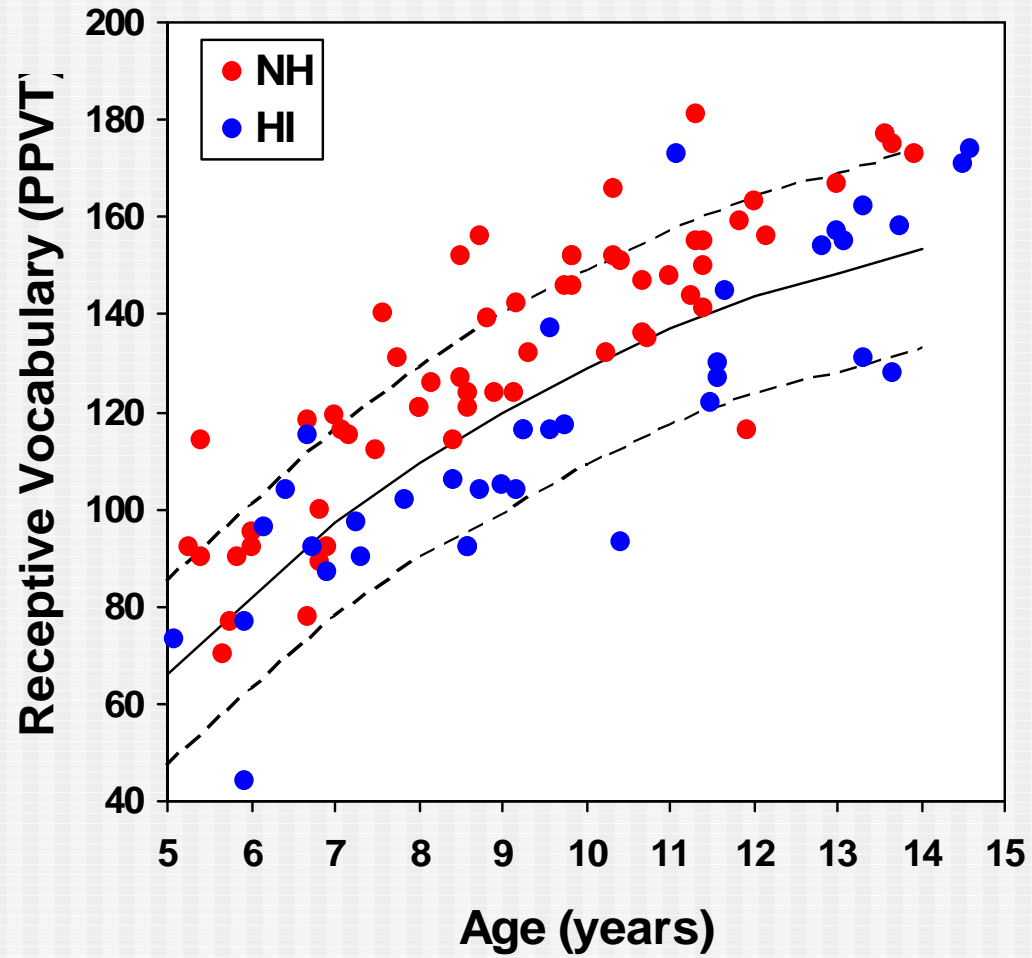
- On average, performance improved slightly in the extended bandwidth condition for both groups
- Both groups demonstrated more consistent word learning in the extended bandwidth condition
- Consistent word learning was more apparent for the children with hearing loss

Amplification

- Frequency shaping was calculated for each child using DSL
- Sensation levels were confirmed for each bandwidth condition



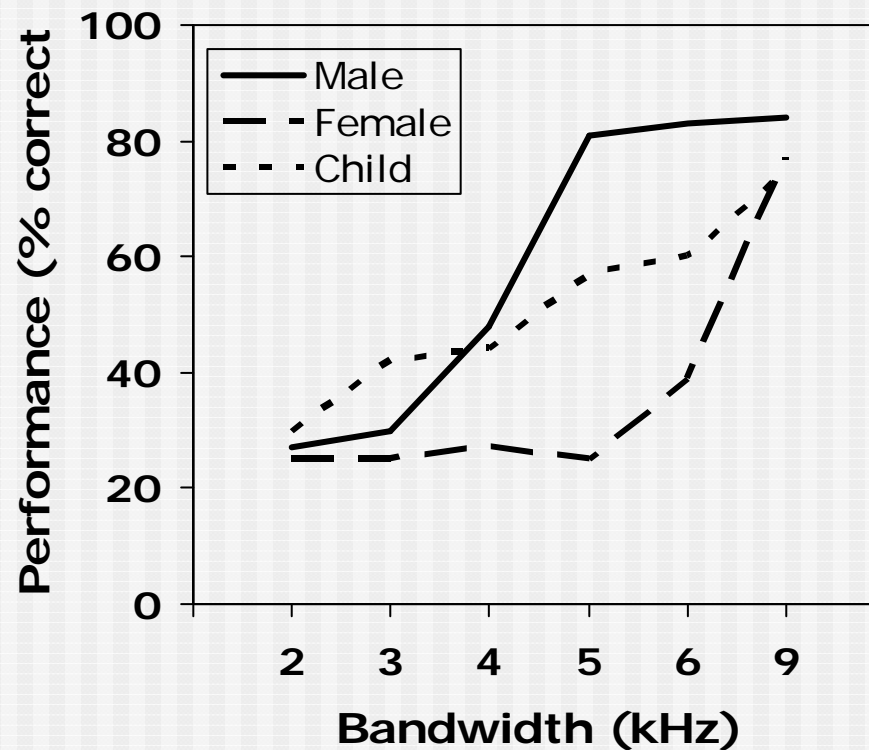
Results



Background

The effect of stimulus bandwidth on the perception of /s/ in normal- and hearing-impaired children and adults

(Stelmachowicz, Pittman, Hoover, & Lewis 2001)



Background

Novel-word learning in normal-hearing and hearing-impaired children

(Stelmachowicz, Pittman, Lewis, Hoover 2004)

