Getting Amplification Right: Interpreting speech results for your hearing aid fitting

Josephine Marriage PhD

Phonak Sound Foundation

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Validation: Is sound meaningful though hearing aids?

Role of Parents:

Put hearing aids on, new ear molds, manage feedback, attend appointments (technology)

Smile, gesture, communicate and respond to infant

Talk, sing, laugh, shout, whisper, point….

Feed brain development for association of meaning

Depending on what they think their baby can hear…

Validation of amplification: need speech-based testing of HA fitting

Systematic and Methodical Observation:

1. Detection of speech with HA (ASSE or CERA)
2. Functional responses to speech via family
3. Confirm *what* they hear through HA
4. Different classes of speech sounds
   - To fine-tune hearing aid fitting
   - To identify progress from previous assessment
   - To identify targets for listening work

Development of audition through early fitting of HA from ABR results

Audiologist perspective:

1. Don't over-amplify!
2. Give some stimulation

Stages of speech perception

- Level 1 detection
- Level 2 discrimination
- Level 3 preference
- Level 4 recognition

(Carney, 1996)

All can be supported by use of hearing aids and/or CI, from early life, ideally <6 months

Parent perspective:

No previous idea of hearing loss…. or

Effects of deafness ….. or

Anyone with deafness……

Hate these hearing aids

Feel inadequate

1. Demonstration of detection

Audiologist perspective:

Main test is ABR for neural integrity and extent of HL

No response on ABR

“sadly, there are no clear traces to the sounds in this test”

Need to demonstrate hearing responses

Parent perspective:

There is NO hearing……. Completely deaf….. Equivalent of being in total darkness…..

….. So why are we using these hearing aids?

Demonstrate improved responses with hearing aids …. Shows benefit

7 weeks old, well baby.
No response at 100 dB ABR on R or L

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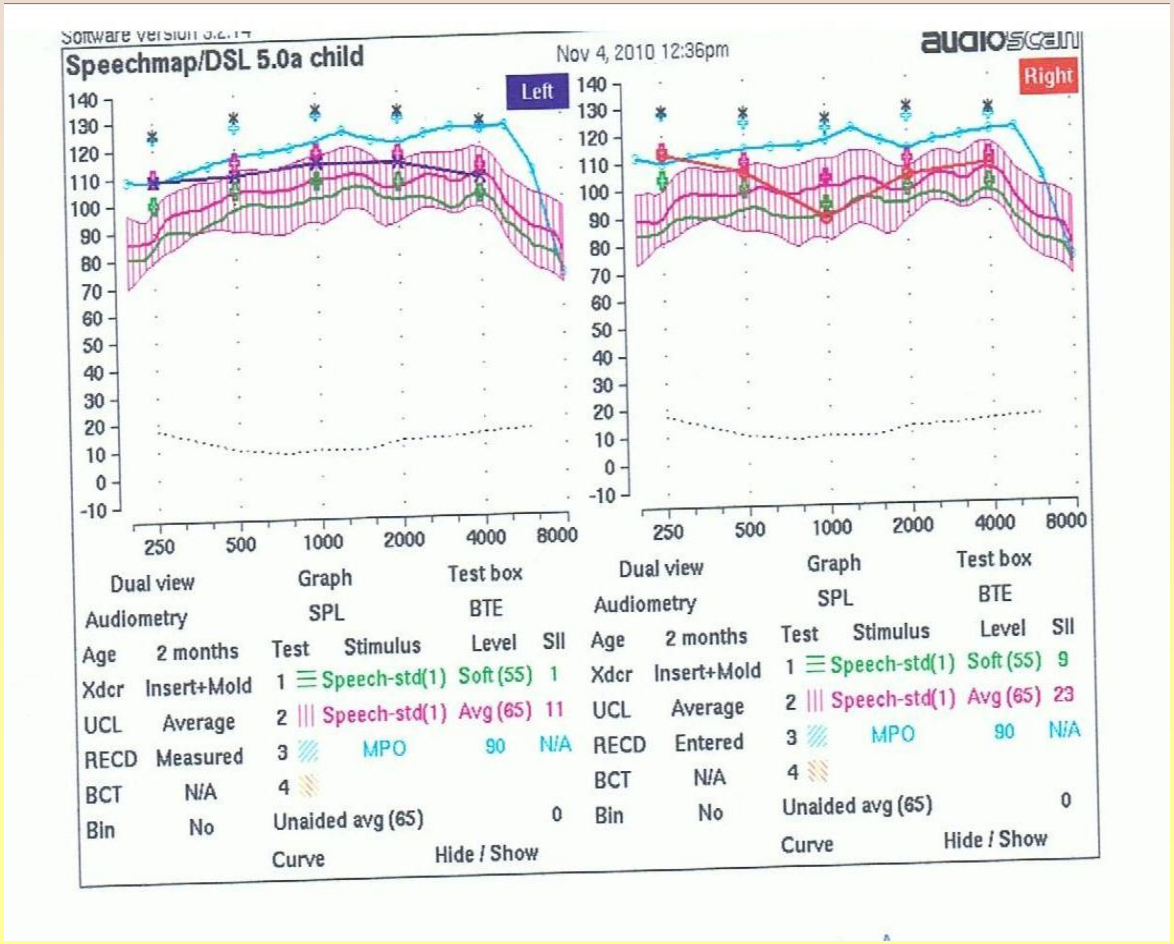
Thank you for your understanding.

REM for Hearing Aid fitting: how to modify response



2. Show behavioural detection of sound 10 weeks, No ABR, Profound Bil HL

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3. Can my baby hear me with her hearing aids? AN (type 1) no ABR

Parent perspective

"I don't think she is hearing my voice as well as Dad's voice"

Parent unsure what constitutes confirmed hearing response

Unsure whether to believe hearing responses

Need to set up situations to see their observations are reliable and crucial

Audiologist perspective

She wearing her hearing aids

I've got reliable thresholds

I've matched HA prescription targets

Therefore: reassure them that it is "developmental". ToD will monitor and recognition will come with time

Set up situations to allow parents to observe hearing

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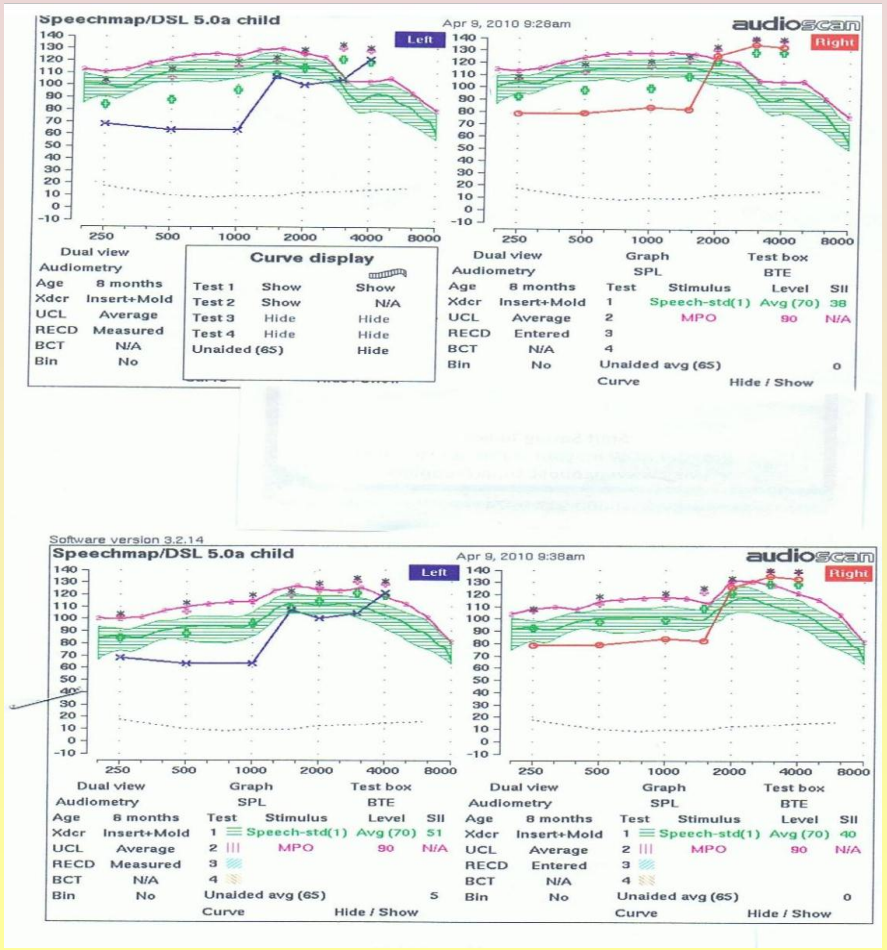
3. Change in hearing levels:

Re-assess hearing levels with VRA

- Hearing levels have improved
- Amplification needs to be changed
- Child accepts hearing aid fitting, wears them well



4. Is she hearing us clearly through her hearing aids? At birth: AN type 1 Absent ABR, recent improvement in responses. 20 months

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Repetition of Ling Sounds

Parent perspective:

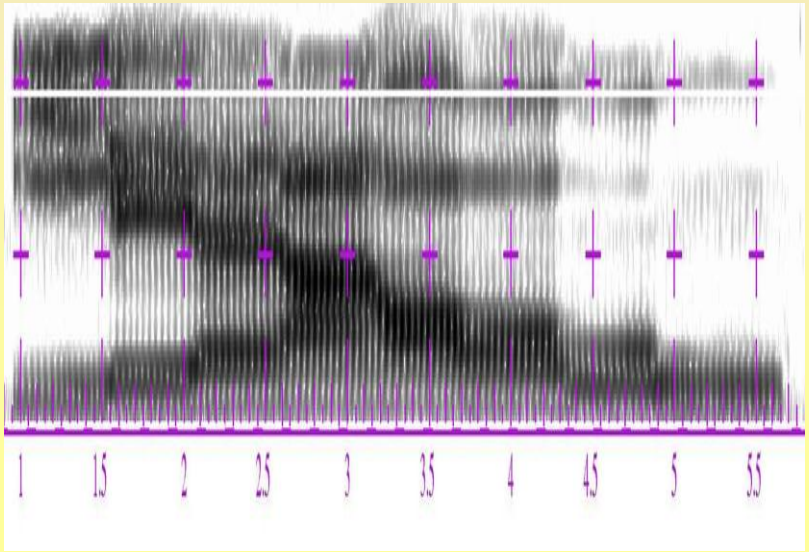
Child isn't able to copy /i/ very well, though can copy the other Ling sounds.

She doesn't say words with /i/ in them

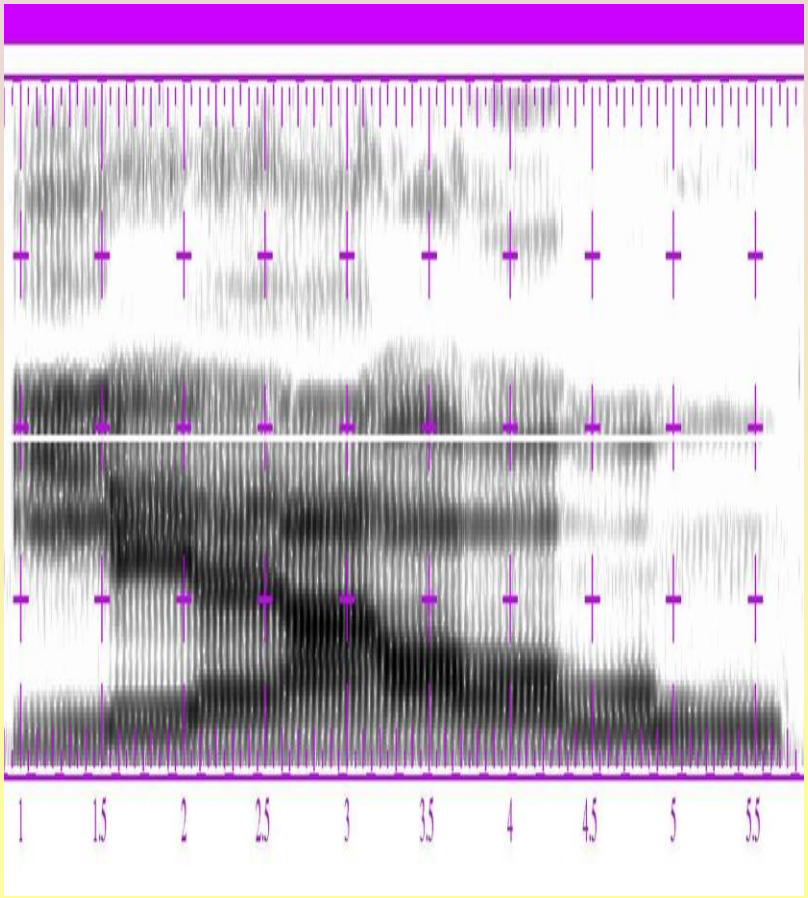
Audiologist thinks: I just heard her say /mumi/ so not sure that is correct

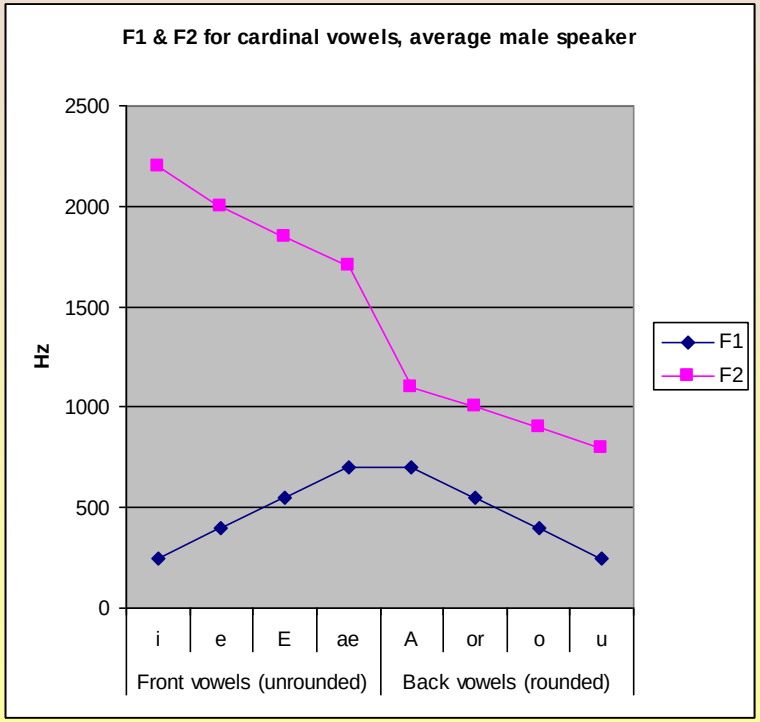
Audiologist perspective:

- Ling sounds
- Formants for discrimination



Cardinal vowels





	mm	u	a	i	sh	ss
250-350 Hz	FB	F1		F1		
500Hz						
750Hz – 850Hz		F2	F1			
1000-1500Hz			F2			
2000 – 2500Hz				F2	FB	
3000Hz						
4000Hz						FB

LING SOUNDS

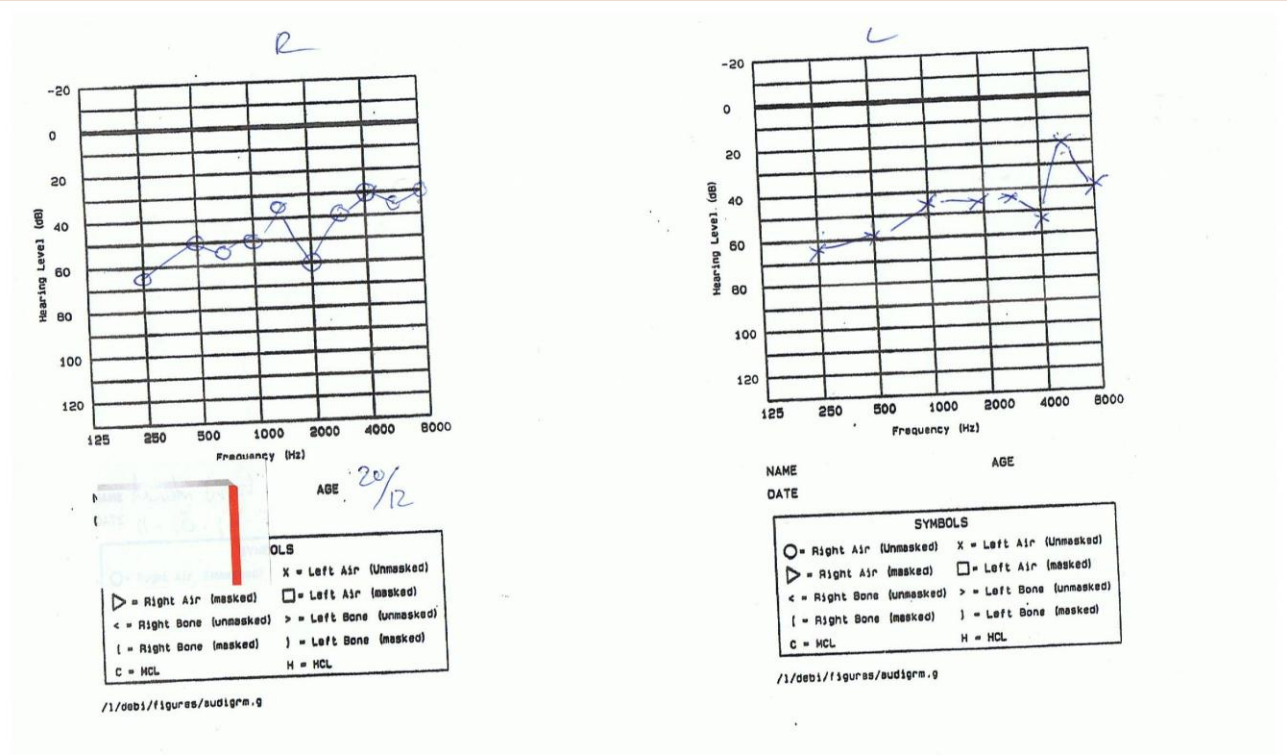
FB: frequency band

F1: first formant

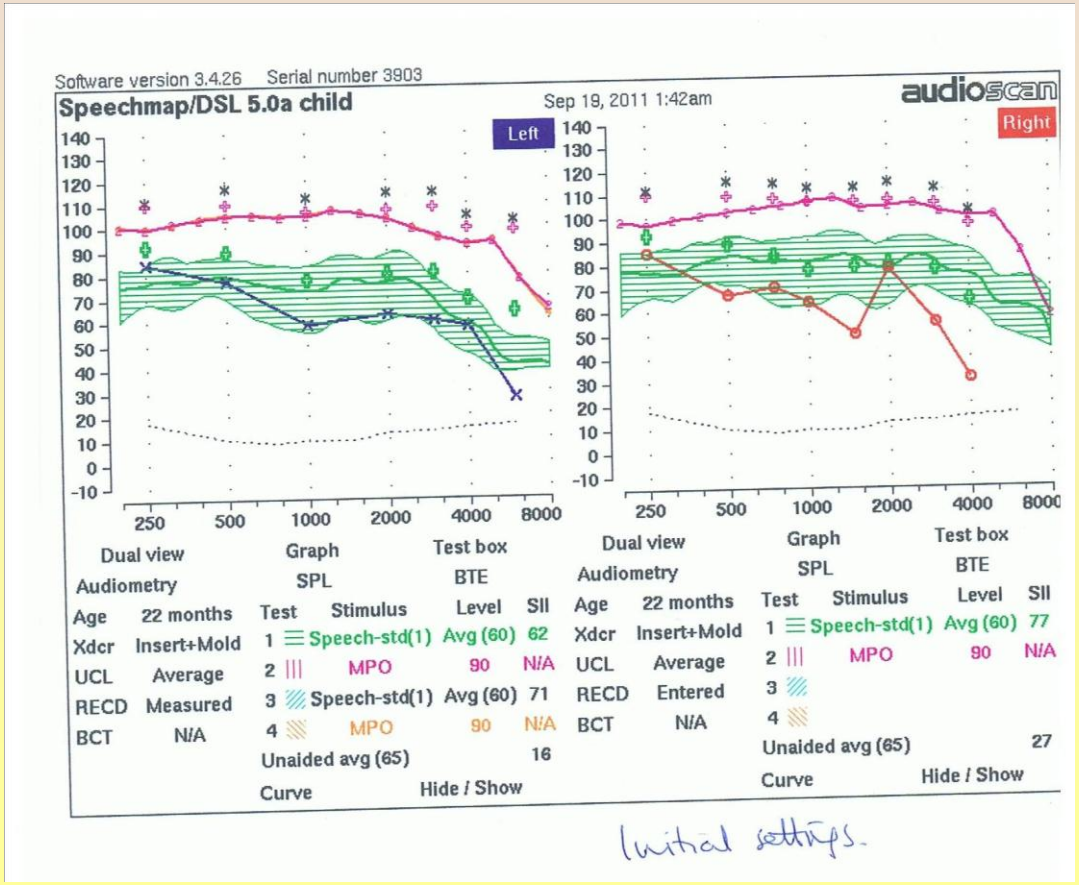
F2: second formant

Source: Ling 1988

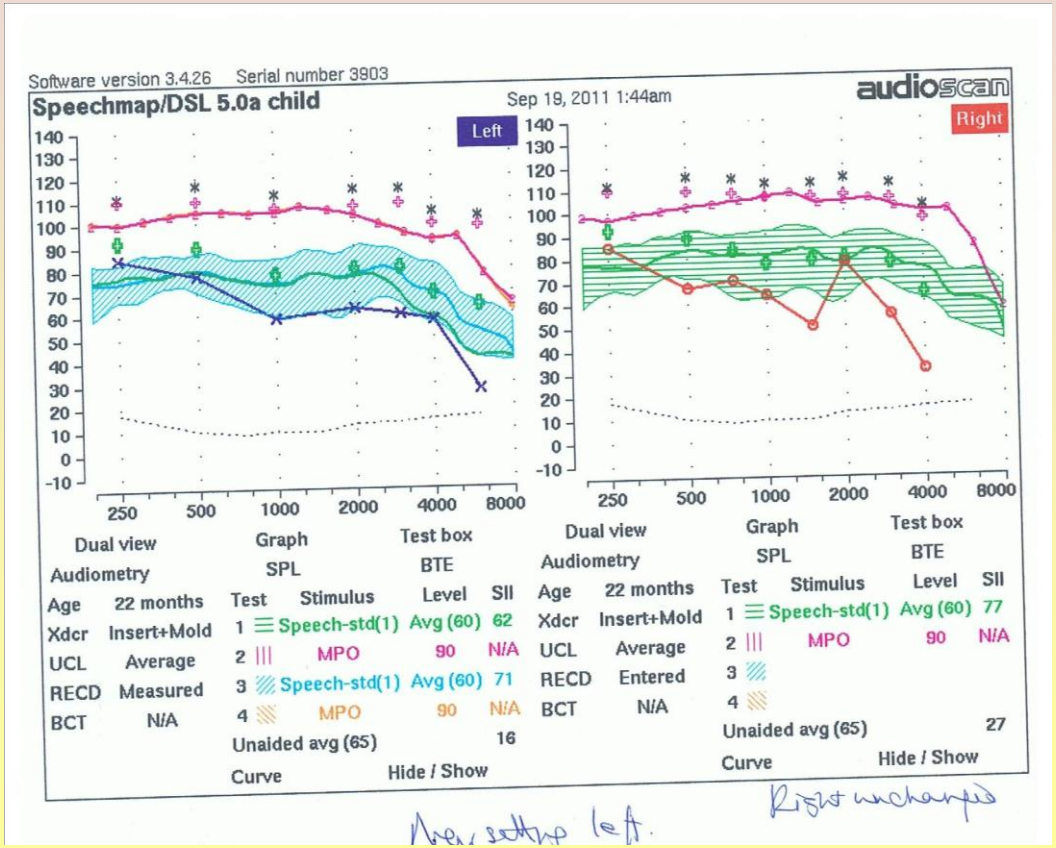
VRA derived Audiogram at 20 months



Current REM fitting: Nios hearing aids



Make adjustments to HA fitting



Video of next habilitation session one week later

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5. Can he discriminate between similar words?

What age for formal clinical speech testing?

Speech perception study in HA children 2 – 8 years:
to see if different HA prescription at early age

Included:

Closed set testing with pictures and words

Ling sounds: oo ah ee sh ss

Open set words: to repeat

Phrases to repeat

Trust the child to respond, but help focus attention if needed

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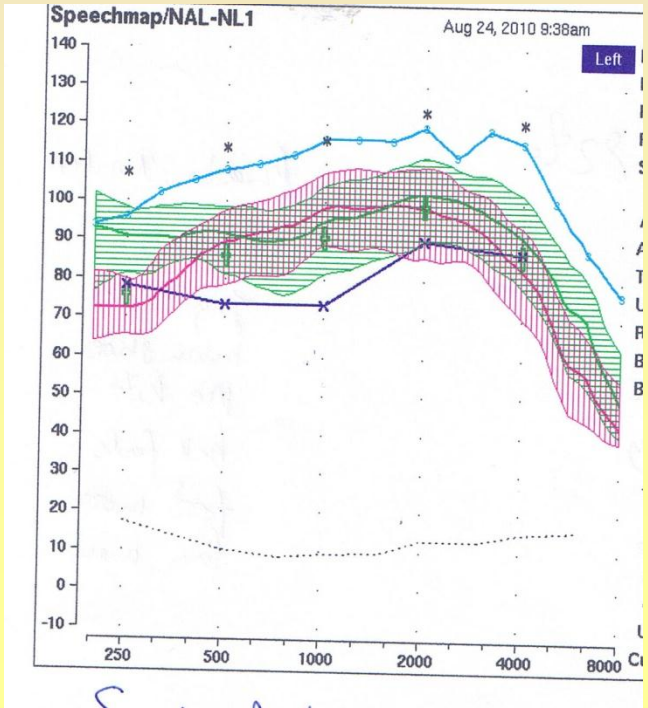
Results:

Ling phoneme detection level (dB) for:

	DSL V	DSL [i/o]	NAL-NL1	
/u/	47.4	48.1	50.0	p = 0.018
/i/	46.7	47.4	49.0	p = 0.019
/s/	51.1	51.3	56.2	p < 0.001

No differences were found
for /a/ and /sh/ detection levels.



Closed set computerised testing CAPT (2 – 8 years)

Closed set discrimination (%): p <0.001 (cat, fat, mat, bat)

	DSL V	DSL [i/o]	NAL-NL1
mean	80.1	81.8	74.1

Closed set phoneme detection (%): p<0.001 (eye, ice, lice, slice)

	DSL V	DSL [i/o]	NAL-NL1
mean	84.2	95.6	77.9

Closed set vowel in noise (%): (tea, tar, tie, two) p = 0.32 (NS)

	DSL V	DSL [i/o]	NAL-NL1
mean	84.0	86.5	81.2

Open set words: list of 10 words, tested at 65 and 50 dB (4 – 8 years)

Open set word recognition with 65 dB presentation
No significant difference between prescriptions

Open set word recognition (50 dB) p <0.001

	DSL V	DSL [i/o]	NAL-NL1	
mean	**22.4**	**23.1**	**19.7**	**/30**

Phrase testing (CPT) (dB) (adaptive pres) p=0.001

	DSL V	DSL [i/o]	NAL-NL1	
mean	**39.4**	**38.8**	**41.5**	**dB**

CAWL words in noise p = 0.055

	DSL V	DSL [i/o]	NAL-NL1	
mean	**24.5**	**24.5**	**21.8**	**/30**

Important points for speech testing:

- **Have high expectations for child's ability**
- **Make it fun, not too long**
- **Let the child do the test in their own way**
- **Tester must be blind to condition under test**
- **Only one child dropped out because couldn't do testing (ASD)**

***Take Home Message for clinical speech testing*:**

Can give reliable and valuable results to inform hearing aid fitting and progress

Every decibel of the hearing aid fitting matters in optimising speech perception.

Must have systematic method for speech discrimination that identifies progress and next target for habilitation.

What age for *informal* speech testing for information about hearing aid fitting?
From birth onwards…….

- Need to set up the situation to demonstrate child's use of hearing for specific speech sounds
- It isn't enough to expect child to learn from general sounds around them
- Role of habilitation key worker is to help support listening and vocalisations

How do we improve our hearing aid fittings? Need parents to be experts in their own child

We need to:

- **Listen to what parents report, explore it and respond to it**
- **Use information from structured behaviour observation and informal observation of responses into hearing aid prescription**
- **NOT to attribute behaviours to “developmental stage” and thereby ignore information**

Speech-based testing is crucial for:

- Validating functional benefit of hearing aid fitting
- Empowering parents to provide “brain food”
- Fine-tuning amplification on an informed basis to improve discrimination of speech cues
- Information on expectations (and limitations) of hearing aid use and benefit
- Monitoring current progress and setting targets for habilitation

Thanks for listening