

Beyond the Audiogram:

Diagnostic and Verification Tools to Improve Hearing Aid and Cochlear Implant Fittings

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Defining the Problem

- Hearing sound (audibility) is the beginning, not the end of successful hearing rehabilitation
- Typical hearing testing and hearing aid verification define only part of the problem
- Current hearing aids and cochlear implants have features not testable with audibility-based measures

Under-utilized tools

- Real World Validation (APHAB)
- Expanded Word Recognition Testing
- Frequency Lowering
- Dedicated Noise Reduction Programs
- Impulse noise reduction

APHAB

- Abbreviated Profile of Hearing Aid Benefit (Cox and Alexander 1995)
- Identifies frequency of listening difficulty in 4 areas:
 - Ease of Communication (Quiet settings)
 - Reverberation
 - Background Noise
 - Aversiveness (Sensitivity to sudden loud sound)

APHAB

- Included in Noah hearing aid fitting framework used by nearly all hearing care professionals
- Takes less than 5 minutes to complete
- Can compare function to others in similar normative groups and between interventions


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APHAB Question Samples



Patient Information		Analysis Setup		Conditions to Test	
Name:	Betty APHAB	Type of Test	<input checked="" type="radio"/> Unaided / Aided	<input checked="" type="checkbox"/> Unaided	<input type="checkbox"/> Aided
Date of Birth:	January 16, 1934	<input type="radio"/> Hearing Aid 1 / 2	<input checked="" type="checkbox"/> Aided		
Audiologist:	Brad Ingrao, MEd	Example and Instructions			
Assessment date 1:	March 22, 2005				
Assessment date 2:	March 23, 2005				
		Without Hearing Aid		With Hearing Aid	

Question	Without Hearing Aid	With Hearing Aid
1. When I am in a crowded grocery store, talking with the cashier, I can follow the conversation.	A B C D E F G	A B C D E F G
2. I miss a lot of information when I'm listening to a lecture.	A B C D E F G	A B C D E F G
3. Unexpected sounds, like a smoke detector or alarm bell are uncomfortable.	A B C D E F G	A B C D E F G
4. I have difficulty hearing a conversation when I'm with one of my family at home.	A B C D E F G	A B C D E F G
5. I have trouble understanding the dialog in a movie or at the theater.	A B C D E F G	A B C D E F G
6. When I am listening to the news on the car radio, and family members are talking, I have trouble hearing the news.	A B C D E F G	A B C D E F G
7. When I'm at the dinner table with several people, and am trying to have a conversation with one person, understanding speech is difficult	A B C D E F G	A B C D E F G
8. Traffic noises are too loud.	A B C D E F G	A B C D E F G
9. When I am talking with someone across a large empty room, I understand the words.	A B C D E F G	A B C D E F G

 21st Century Hearing Care



Expanded Word Recognition Tests

- Binaural Unaided Testing
- Aided Testing at 60 dB SPL

Ear	Test	dB	%	SNR		
R	WRS	80	44%	44%	AC	NU No. 6 CNC List 2A
L	WRS	80	32%	32%	AC	NU No. 6 CNC List 3A

Frequency Lowering

- Addresses “dead hair cell” regions
- Can provide 15 to 20% improved word understanding with 4-6 weeks practice
- Available from all major manufacturers

Ear	Test	dB	%		SNR			
L	WRS	48	56%	56%		SF		NU No. 6 No FreqLower
L	WRS	48	72%	72%		SF		NU No. 6 FreqLow

Noise Reduction Programs

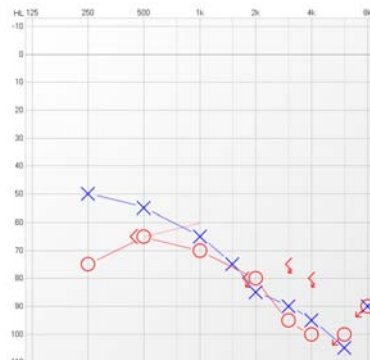
- Automatic scene analysis programs are great but...
 - Several factors produce greater difficulty than can be addressed by these programs:
 - Severity of loss
 - Slower processing due to age
 - Attention issues
- Dedicated, fixed directional programs can often provide more control and predictability in noise

Impulse Noise Control

- Many people have hyper sensitivity to high intensity, short duration (loud impact) sounds.
- Often reported as “hearing aids are too loud”
 - Incorrect lowering of overall amplification
 - Sacrificing dynamic range and audibility
- Most current instruments have a specific control for this type of sound

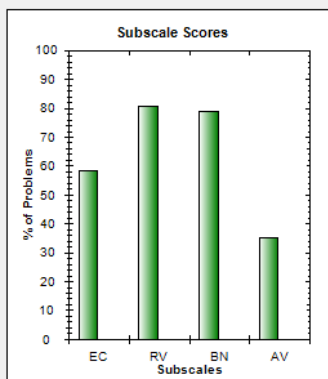
Meet Our Patient

- 75 YO Male Veteran
- HA user since 2004
- Loss of hearing aid benefit in last few years
- Audiogram and word recognition suggest no viable hair cells above 2000 Hz

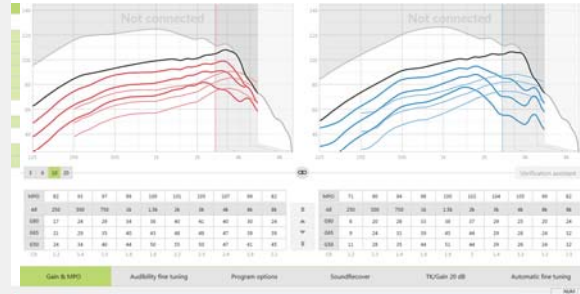


SPEECH AUDIOMETRY																	
RIGHT SRT				RIGHT SPEECH RECOGNITION					LEFT SRT				LEFT SPEECH RECOGNITION				
1	2	1	2	3	4	5	6	PBMAX	1	2	1	2	3	4	5	6	PBMAX
74		16						16	80		24						24
Level		100						100	Level		100						100
List		2A						2A	List		2A						2A
ML		40						40	ML		40						40
INTER-TEST CONSISTENCY (R): <input checked="" type="checkbox"/> GOOD <input type="checkbox"/> POOR <input type="checkbox"/> FAIR									INTER-TEST CONSISTENCY (L): <input checked="" type="checkbox"/> GOOD <input type="checkbox"/> POOR <input type="checkbox"/> FAIR								
MATERIAL: <input type="checkbox"/> MARYLAND CNC <input type="checkbox"/> CIDW-22 <input checked="" type="checkbox"/> NU-6 <input type="checkbox"/> OTHER, SPECIFY:									PRESENTATION: <input checked="" type="checkbox"/> RECORDED <input type="checkbox"/> MLV								

Pre-Intervention APHAB and fitting



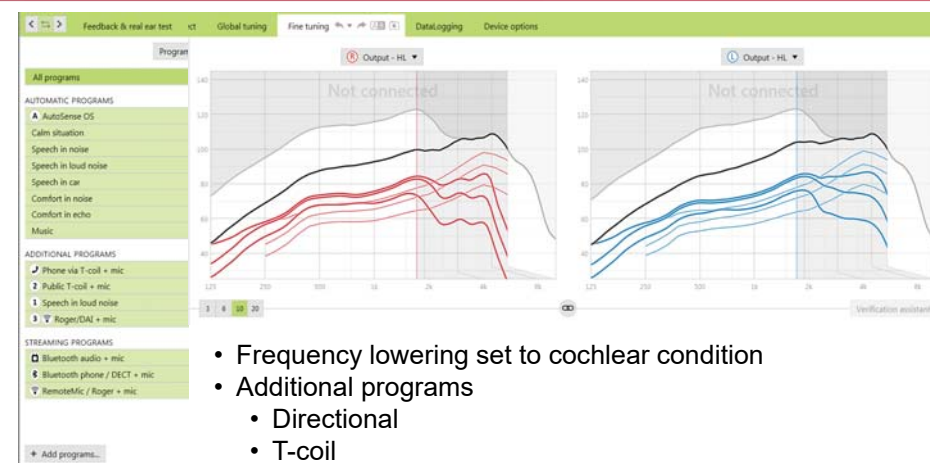
Percentiles:
 EC: 85
 RV and BN: 95
 AV: 50



Notes on fitting:

- Frequency lowering set to default
- Only an “automatic” program
- No t-coil

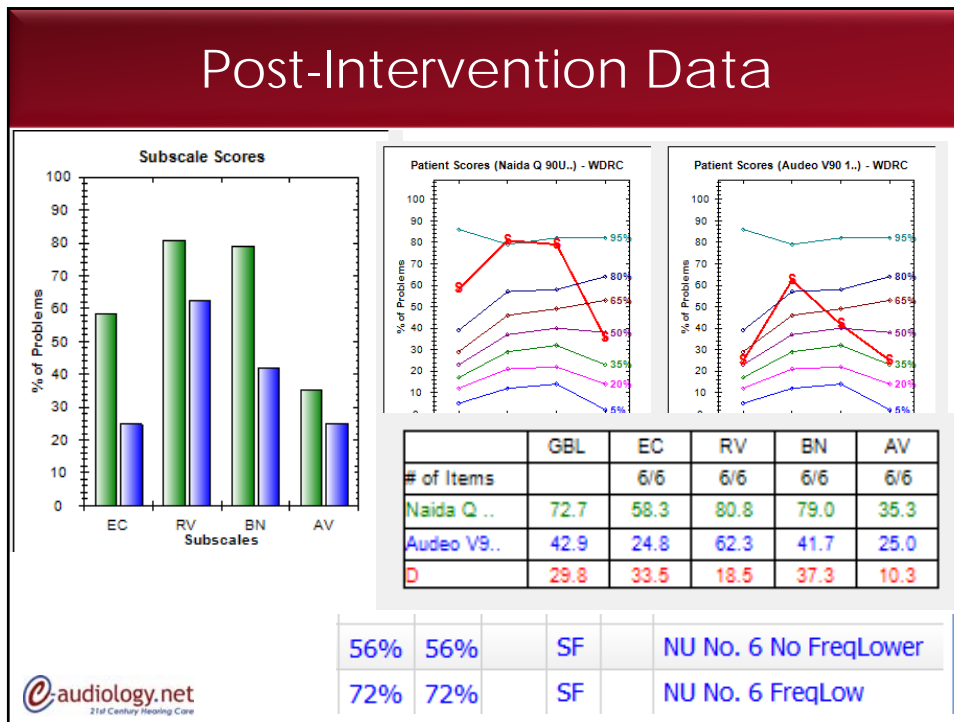
New Hearing Aids, and...



- Frequency lowering set to cochlear condition
- Additional programs
 - Directional
 - T-coil
 - Roger

But did it improve his situation?

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Summary

- Hearing loss is more complex than an audiogram and a single word list can assess
- Current hearing aids and cochlear implants have technology to address these complexities
- Your hearing care professional already has tools which can help choose and verify the benefit of these technologies
- Working together, you can most likely improve your day-to-day hearing and quality of life.

Questions?

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“Ask Dr. Brad”

<https://www.youtube.com/user/AskDrBrad>