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ACOUSTIC TECHNOLOGY

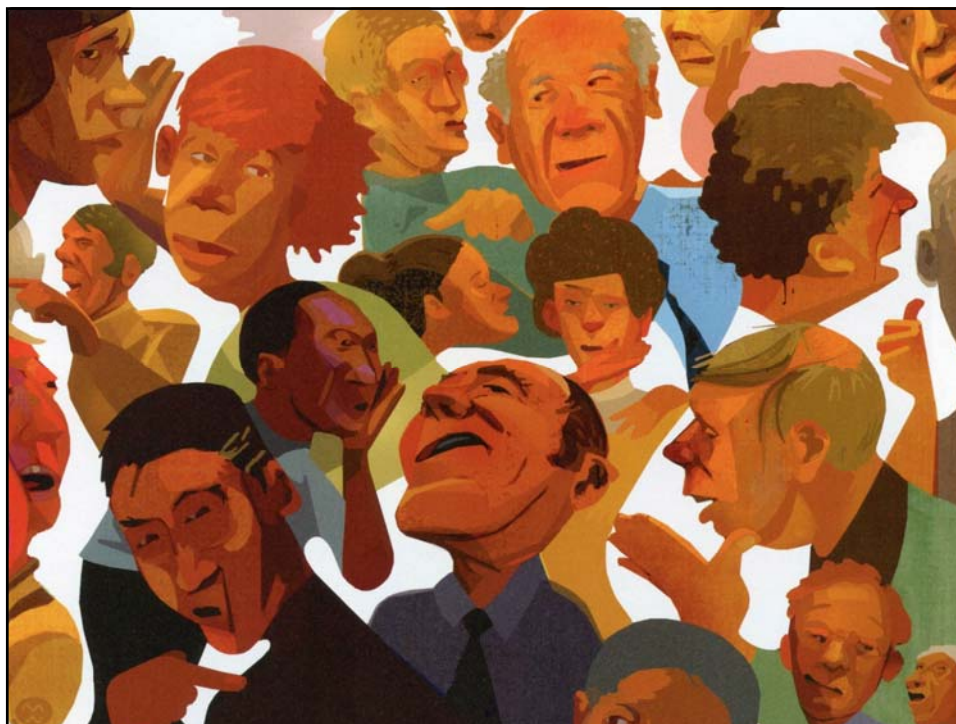
Attacking the Noise Problem: Current Approaches



D.Schum@Oticonusa.com



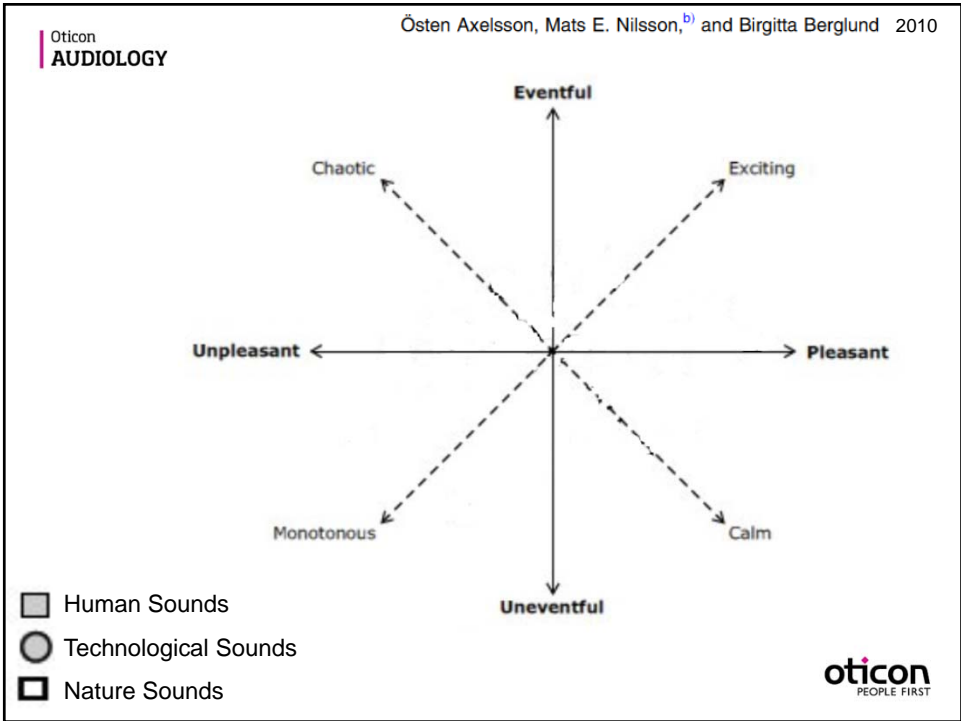
What is the greatest unmet need?

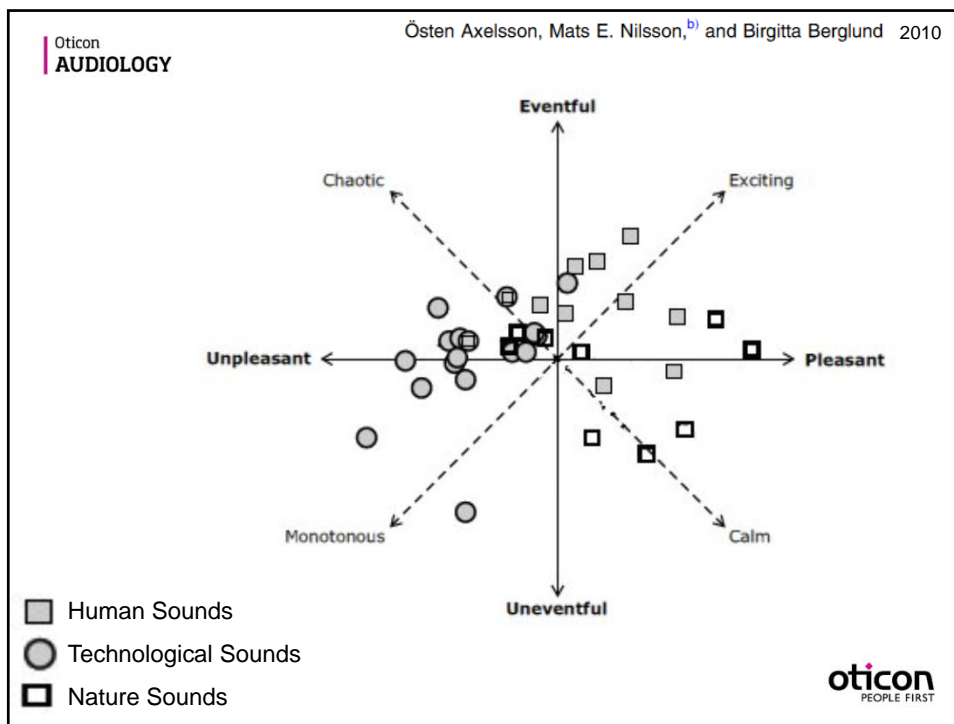


Takeaways

- Brain is the Best Ally
- Subtractive vs. Completion Approaches
- Hard to make Noise Go Away
 - Without significant downsides
- Impact of DIR & NR currently not 24/7
- Giving the Brain more to work with

Soundscapes





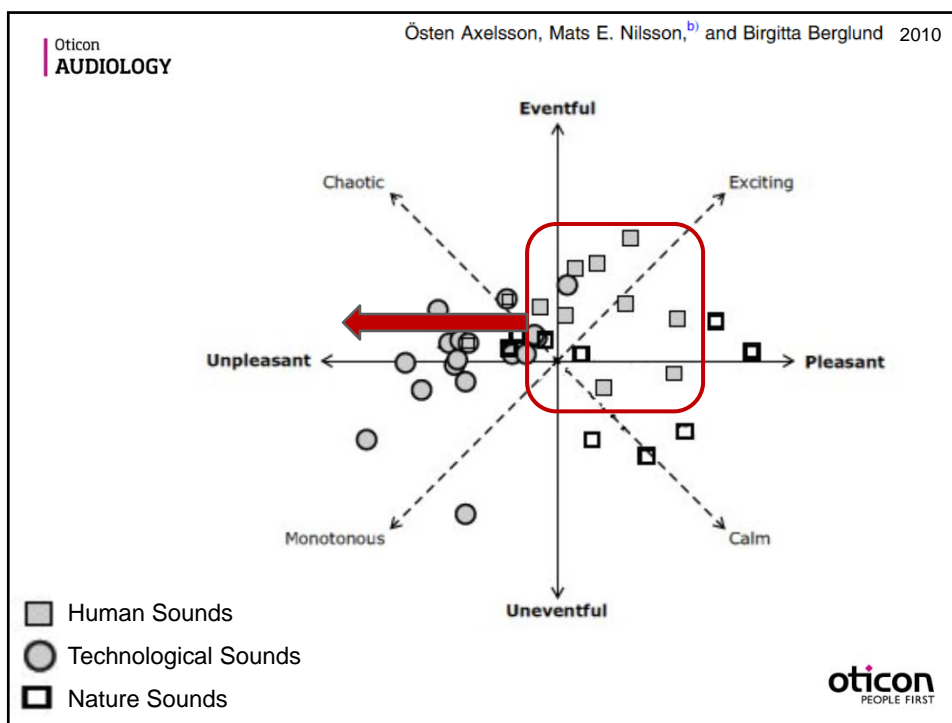
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What bothers hearing aid users: Top Five

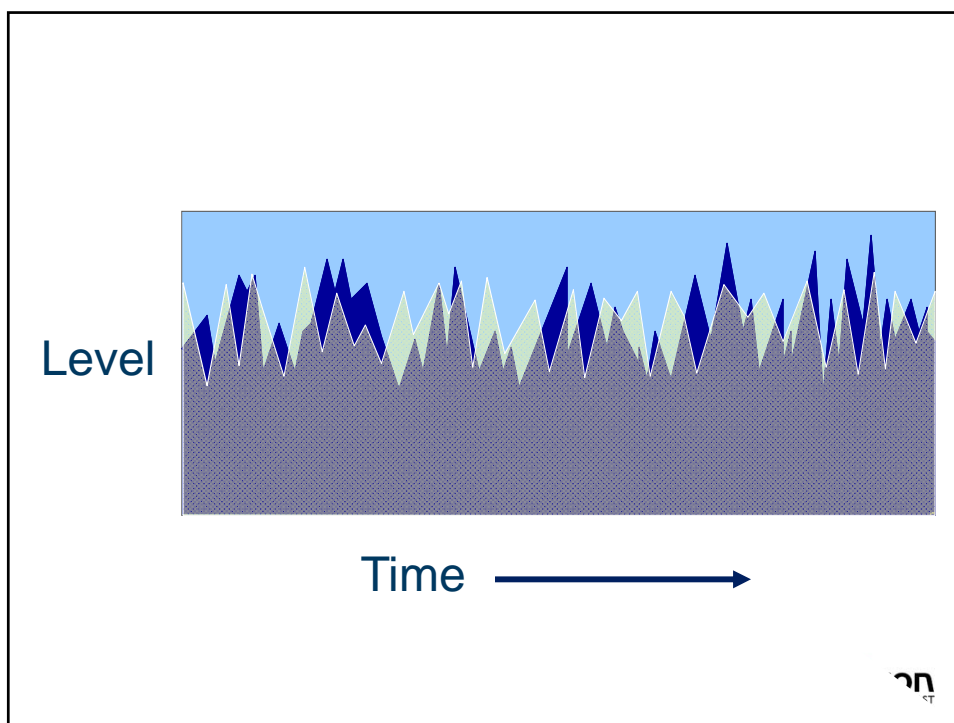
<i>Stated annoying sound or sound source</i>	<i>Description</i>
Verbal human sounds	Sounds produced by people, verbal. An example of these sounds is murmuring.
TV/radio	Sounds emitted from the loudspeakers of TV and/or radio
Vehicles	Sounds produced by vehicles with engines; cars, trains, motorcycles, etc.
Machine tools	Sounds produced by e.g. power saw, drilling-machine
Household appliance	Sounds produced by ordinary household appliances such as washing machine, vacuum cleaner, or electric mixer.

Åsa Skagerstrand*^{1,2}, Stefan Stenfelt^{1,2}, Stig Arlinger^{1,2} & Joel Wikström* 2014

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PEOPLE FIRST



How does the brain manage complex environments?



Natural Voice Separation & Tracking:

- Fundamental Frequency
- Harmonic Structure
- Supra-segmentals
- Visual Cues
- Linguistics
- Loudness
- Location
- Timbre
- Rate
- etc.

The Brain is Opportunistic

Loss of the ability to *organize* sound

Takeaways

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How is the problem currently addressed?



Subtractive vs. Completion



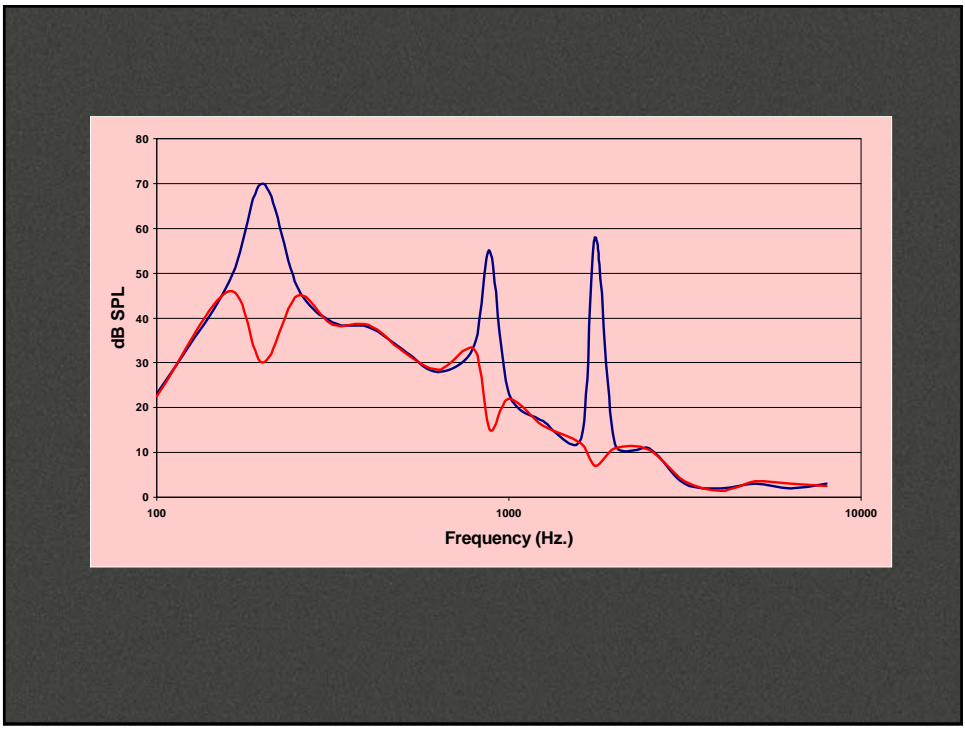
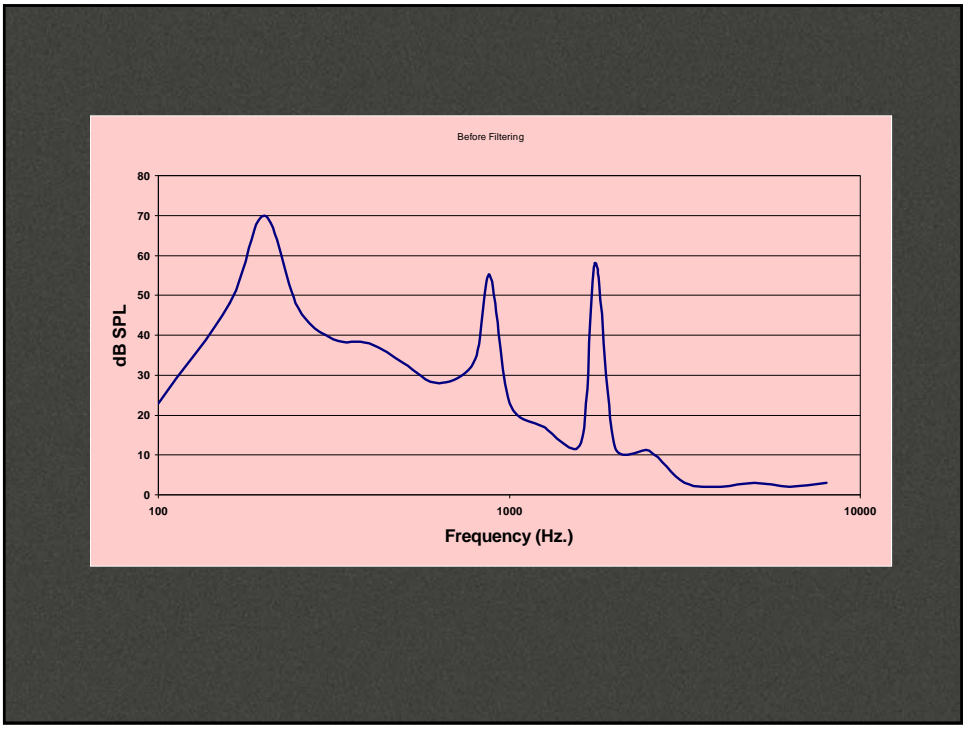
What do you Subtract?

Takeaways

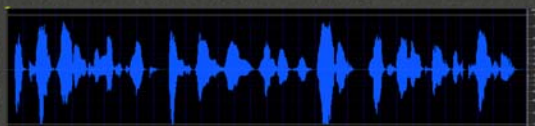
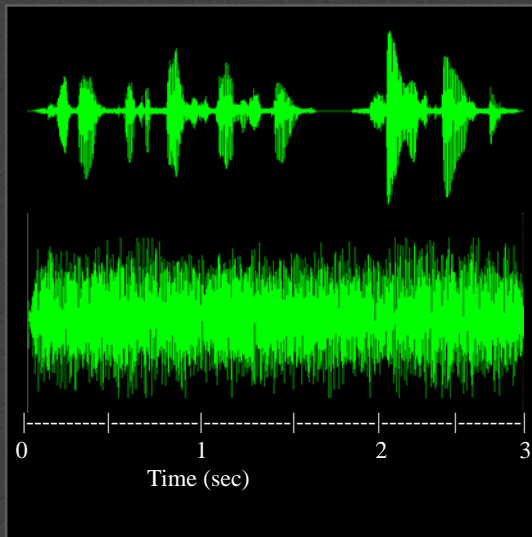
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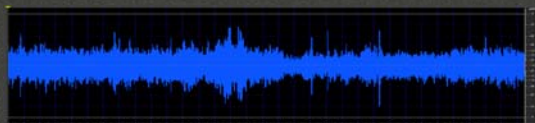
Spectral Subtraction



Modulation Analysis

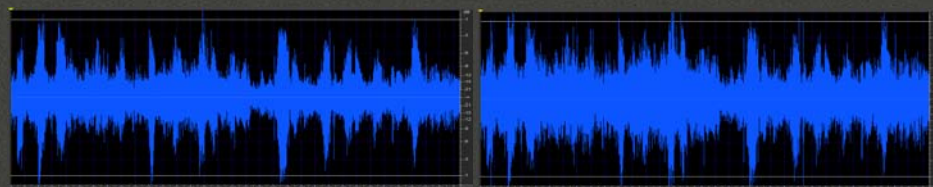


Speech



Noise

Noise only
or
Speech + Noise?





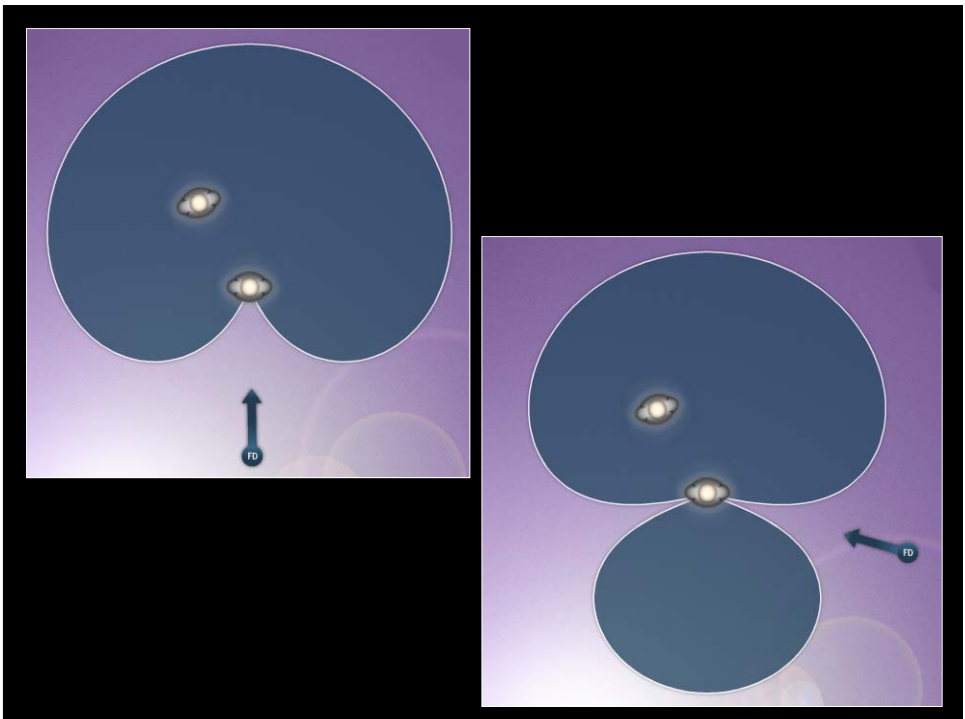
Spectral Subtraction

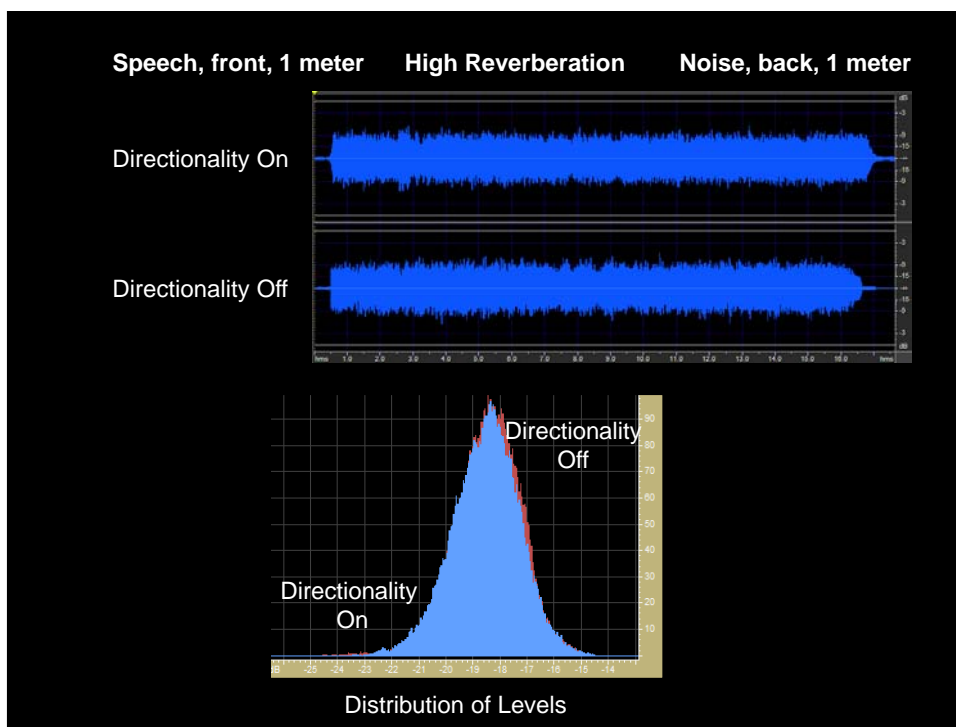
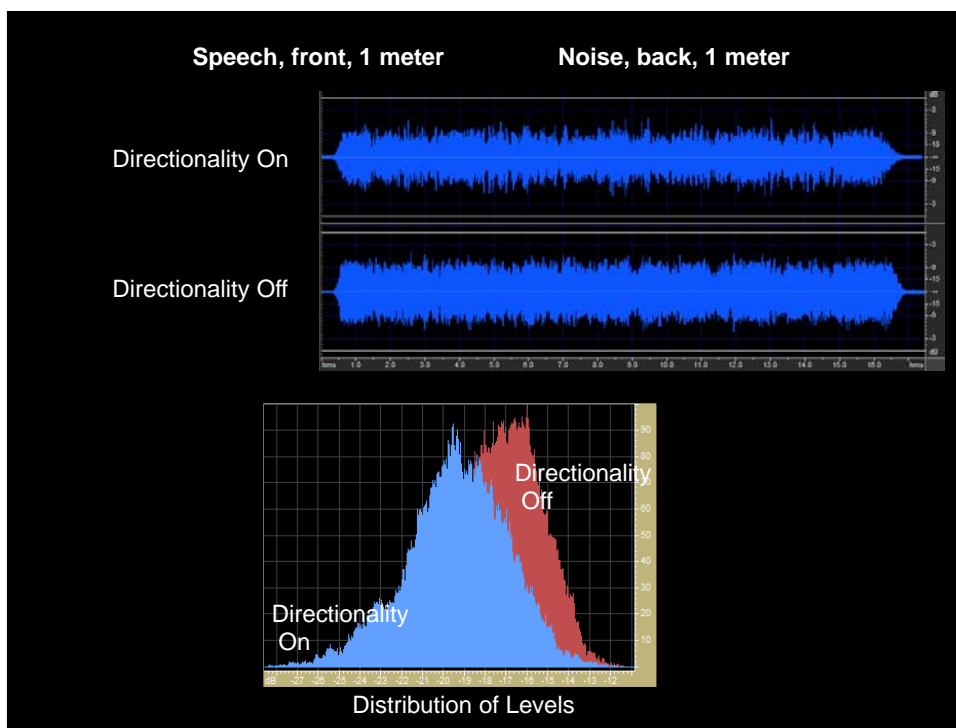
In hearing aids, *filtering is long term*



Effect?

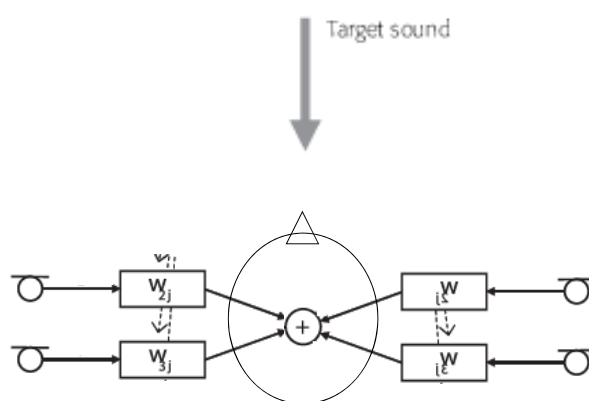
Spatial Subtraction

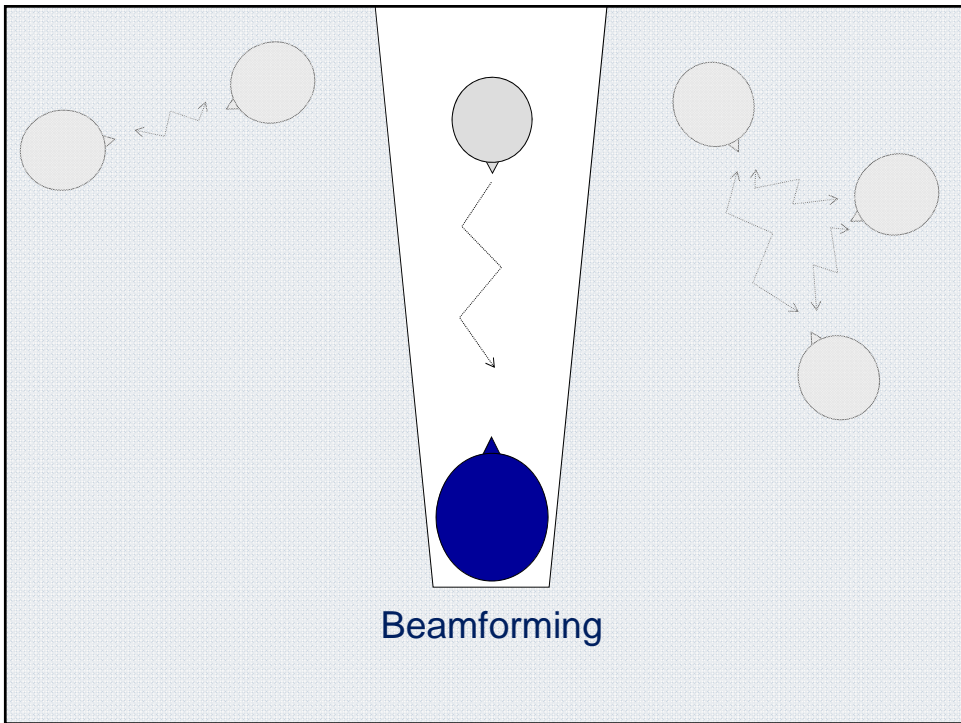
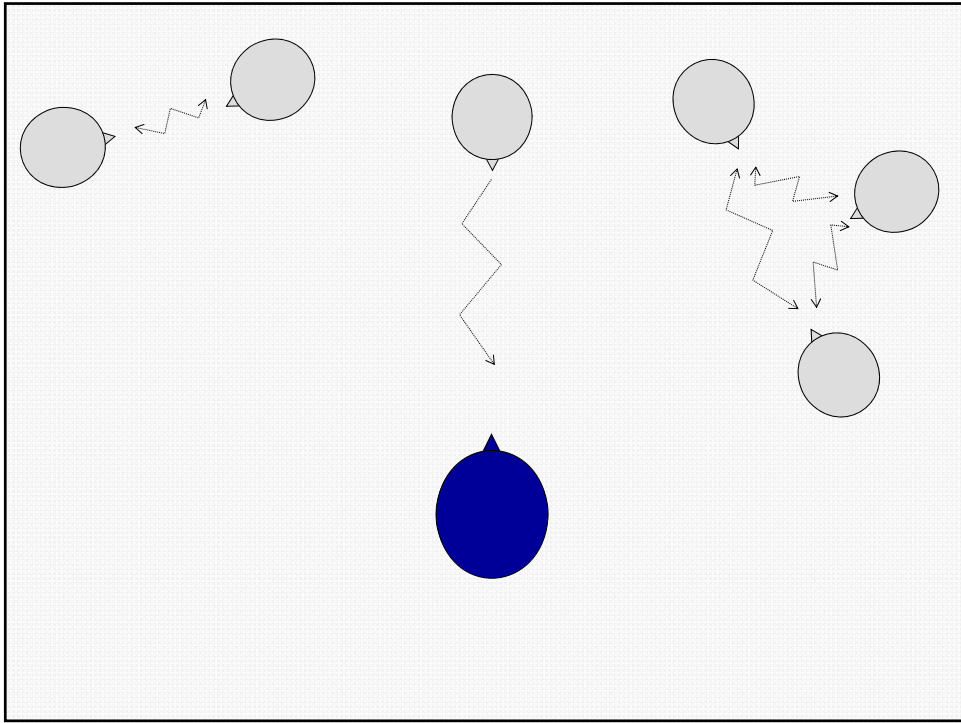




Spatial Subtraction

In hearing aids, *directional* reduces ALL signals in null



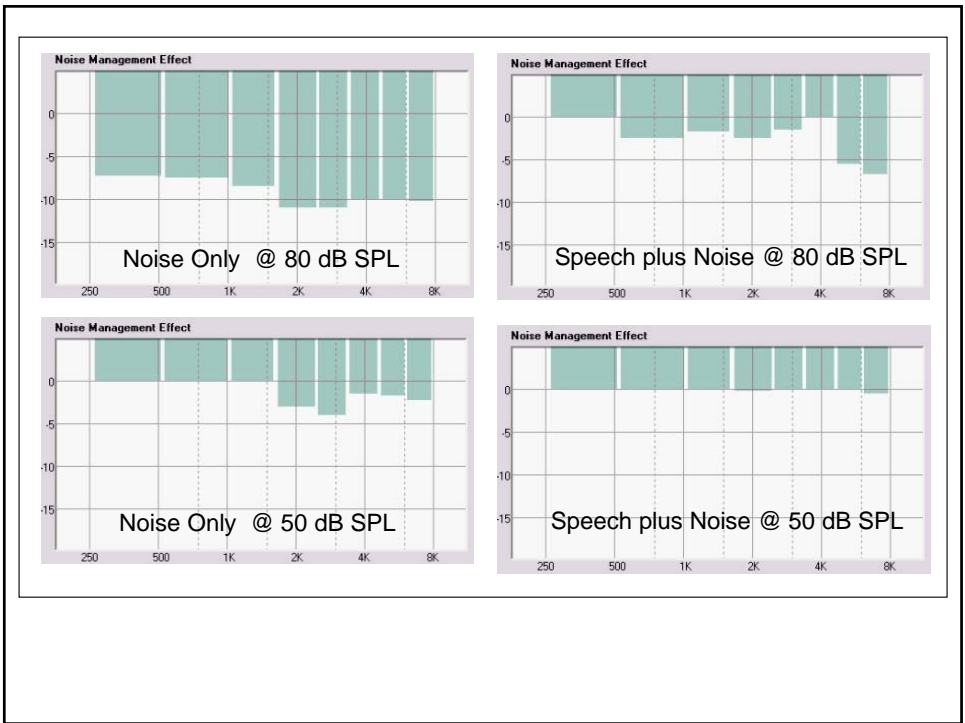
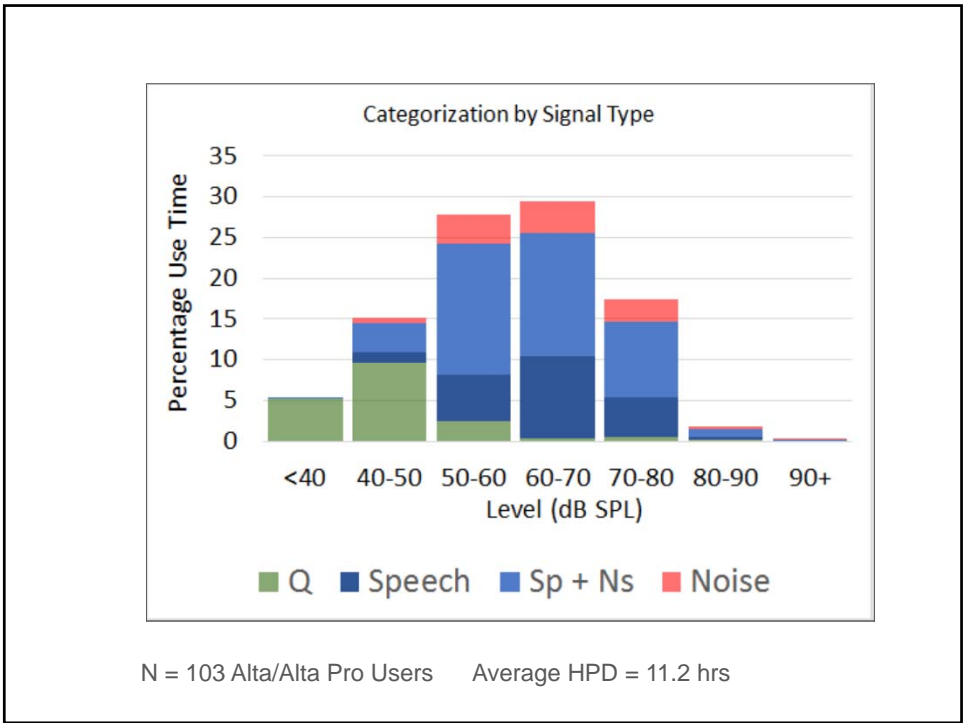


Takeaways

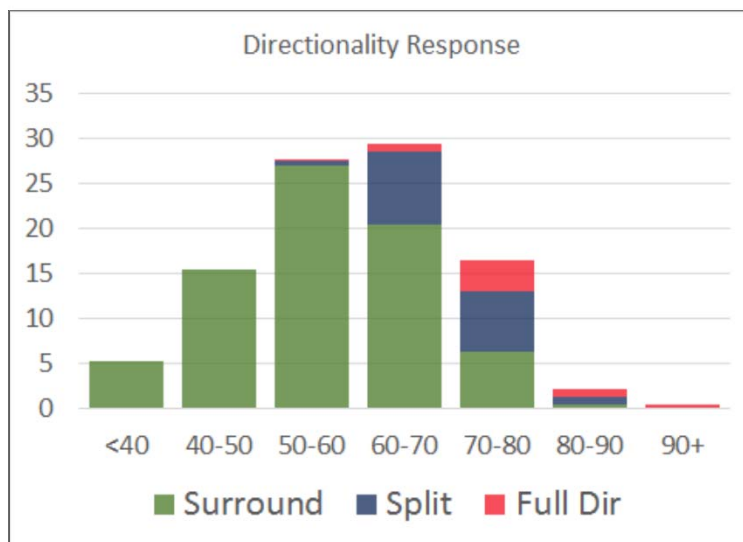
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How Often?



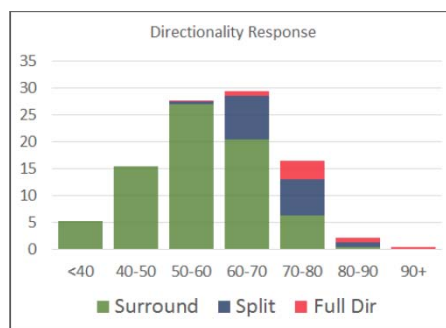
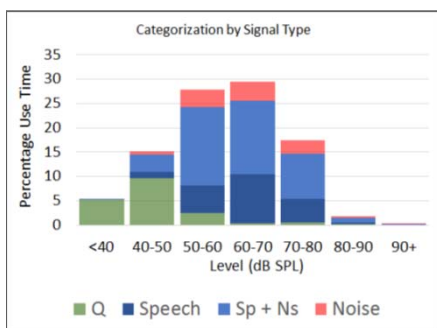
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N = 103 Alta/Alta Pro Users Average HPD = 11.2 hrs



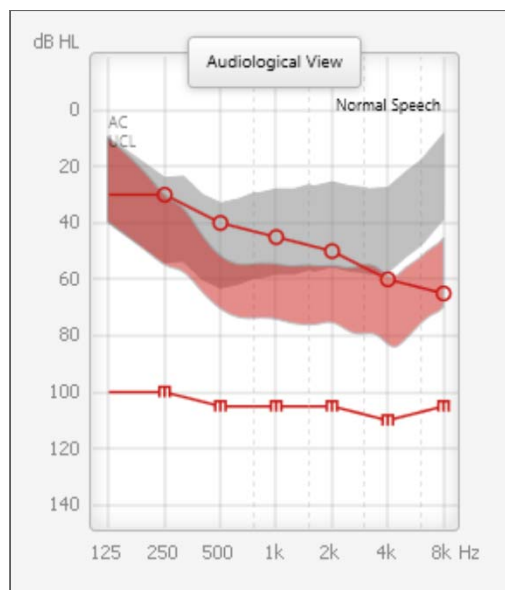
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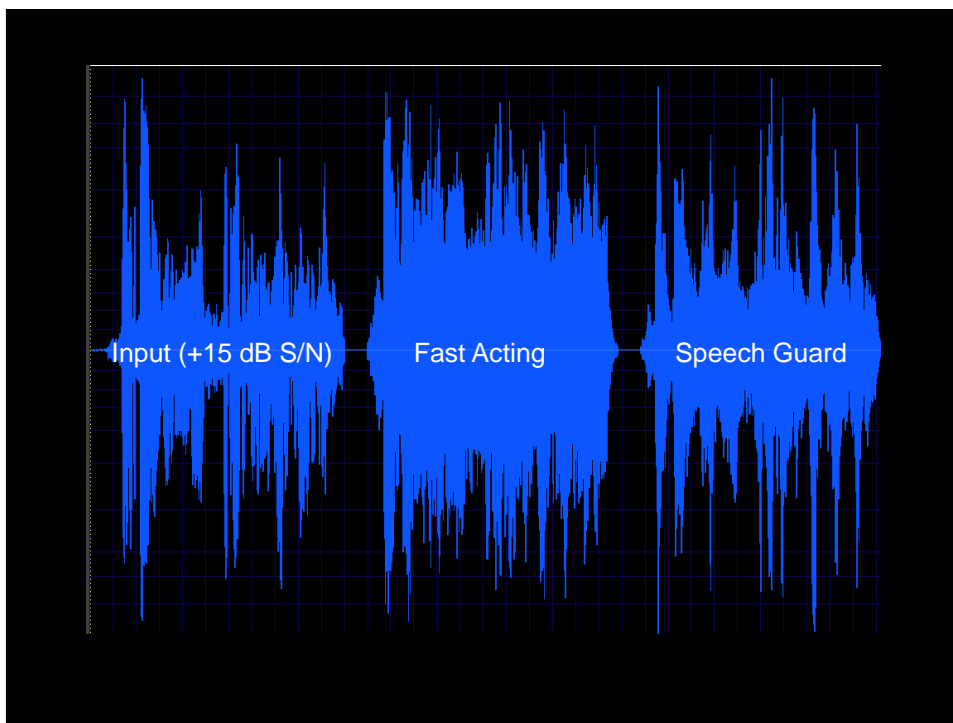
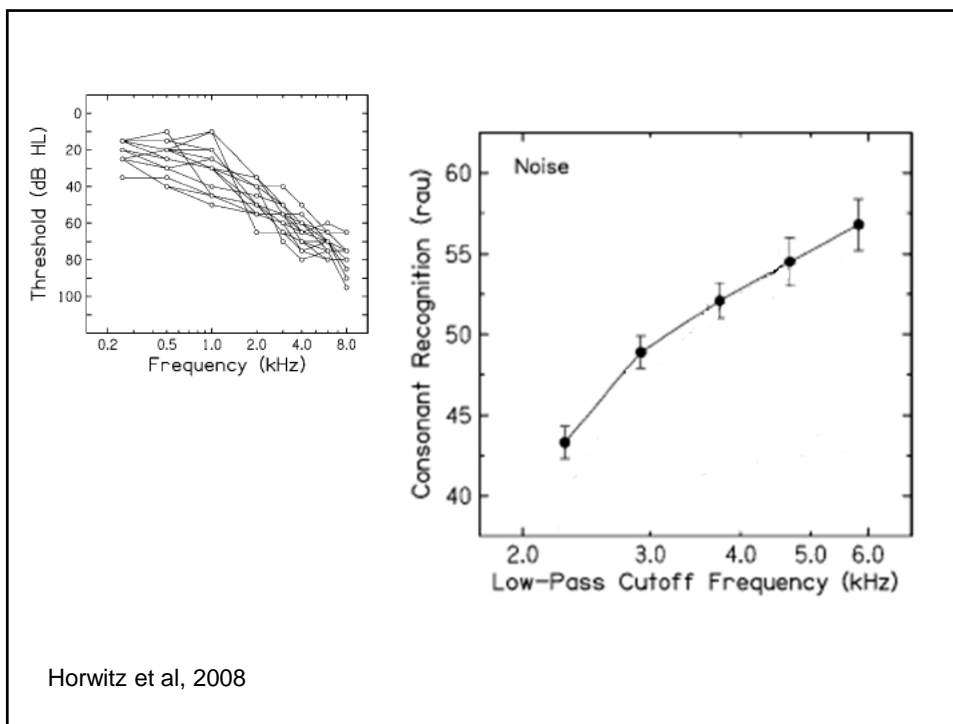


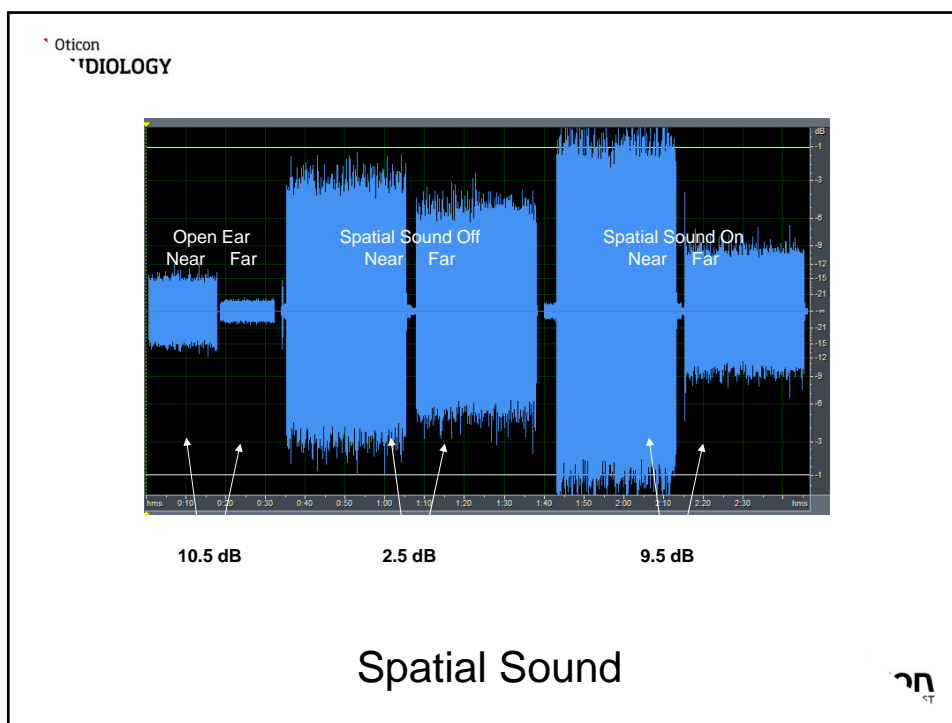
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