



## (Hoe) werkt het in de audiological practice?

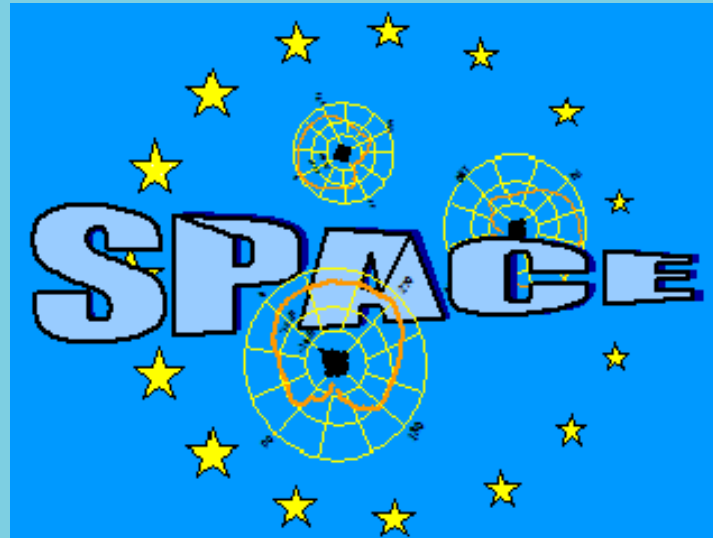
*(How) does it work in audiological practice?*

NvA Najaarsvergadering 24 september 2010

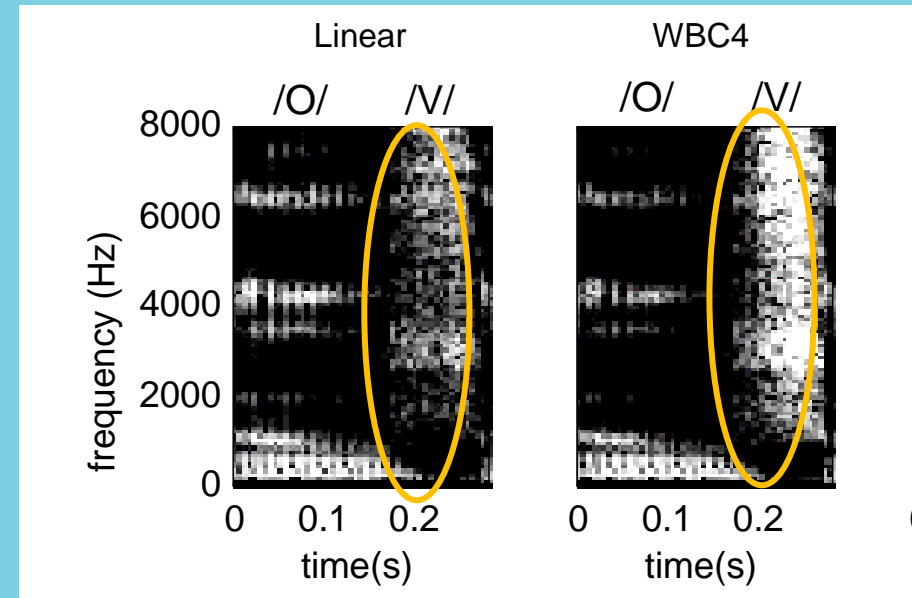
André Goedegebure

klinisch fysisch audioloog, afdeling KNO Erasmus MC

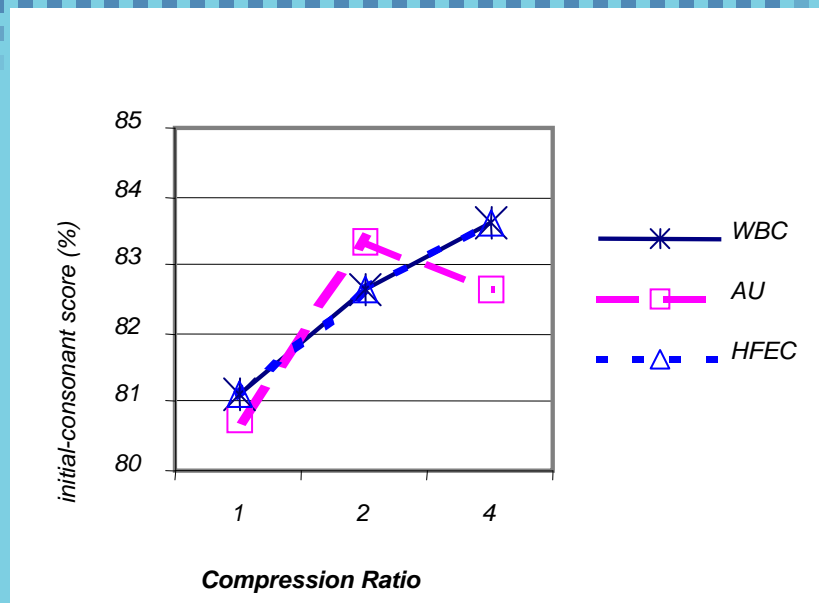
## History: first digital hearing aids



# Advanced Compression techniques



# Effects of compression



Only slight improvements maximum speech score

WDRC: Improved audibility and less problems with loud sounds

Hearing-aid users: relatively high level of satisfaction compared to old situation!

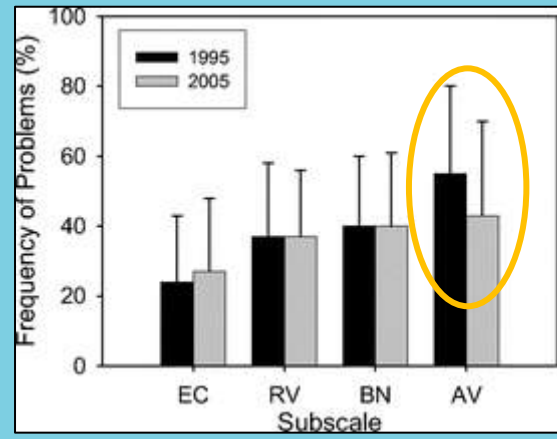
→ not only comfort, but real improved auditory functioning?

# Effects of compression

Johnson JA , Cox RM, Alexander GC *Ear Hear.* 2010 Feb;31(1):47-55.

Comparison APHAB 1995 and 2005 (main difference: WDRC):

- Less “aversiveness to sounds” (AV)
- No difference in communication subscales

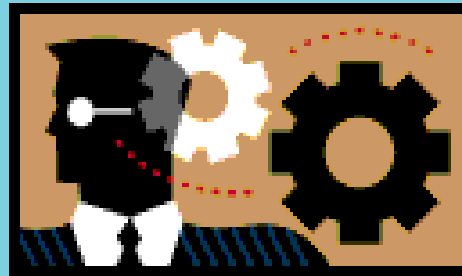


successful adjustment to hearing aids: 82% in 2005 vs. 43% in 1995

# What users profit from what new features?

## Users:

- Hearing loss
- Age
- Life style
- Money



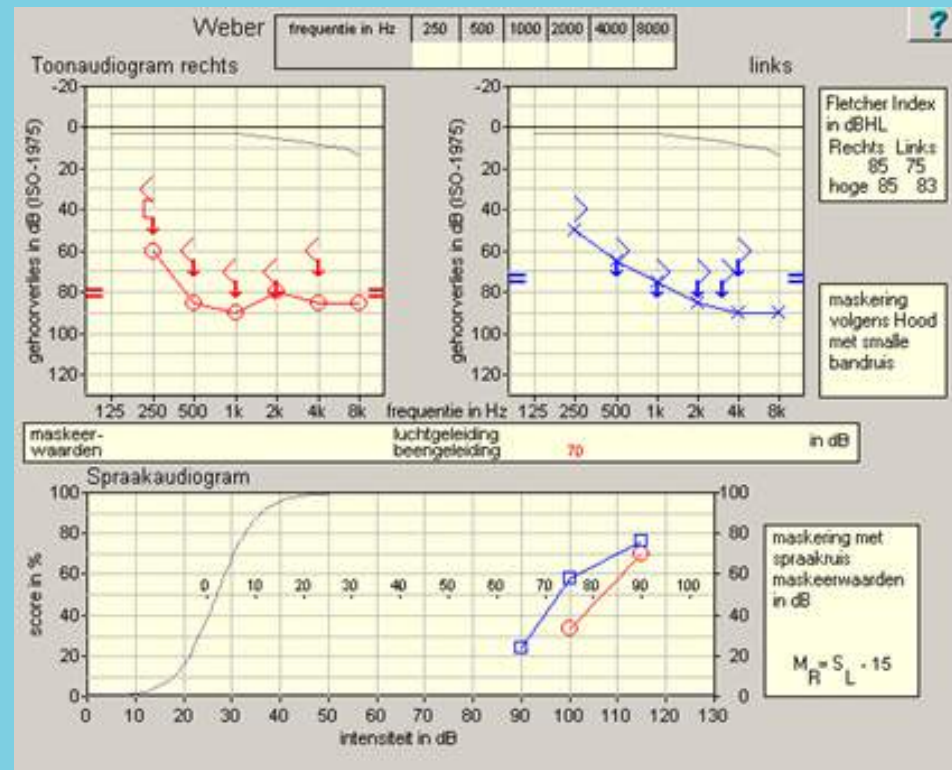
## Features:

- Compression
- Noise suppression
- Directionality
- Anti-feedback
- FM-connectivity

Audiologist and dispenser: find the right match!

# Severe hearing losses

- Improved audibility: compression and anti-feedback
- Improved maximum speech score: incidentally.
- Improved comfort in noisy conditions: noise-reduction and compression



# Speech understanding in noise

Still limited benefits noise-reduction algorithms

- Directionality: few dB's SNR improvement is often enough, only useful in limited conditions.
- General noise reduction: improvement comfort rather than speech intelligibility



Improved connectivity to fm-microphone, telephone, tv, etc.: very effective but not always practical



# Noise reduction

*J Acoust Soc Am.* 2010 Mar;127(3):1491-505. **Luts et al. HEARCOM**

*Multicenter evaluation of signal enhancement algorithms for hearing aids*

*Int J Audiol.* 2009 Dec;48(12):853-67. **Zakis JA, Hau J, Blamey PJ**

*Environmental noise reduction configuration: Effects on preferences, satisfaction, and speech understanding*

*Ear Hear.* 2010 Jun;31(3):345-55. **Stelmachowicz P, Lewis D, Hoover B, Nishi K, McCreery R, Woods W**  
*Effects of digital noise reduction on speech perception for children with hearing loss.*

- No statistical significant effect on Speech perception (SNR)
- Improved listening effort, noise reduction preferred to control

## Light and mild hearing losses

Open fitting: clear practical and acoustical benefit

Improved fine-tuning frequency characteristic

Extended high frequency band

Fitting and fixation may be problematic

Thin tubes easily damaged or blocked



# Steep high-frequency losses

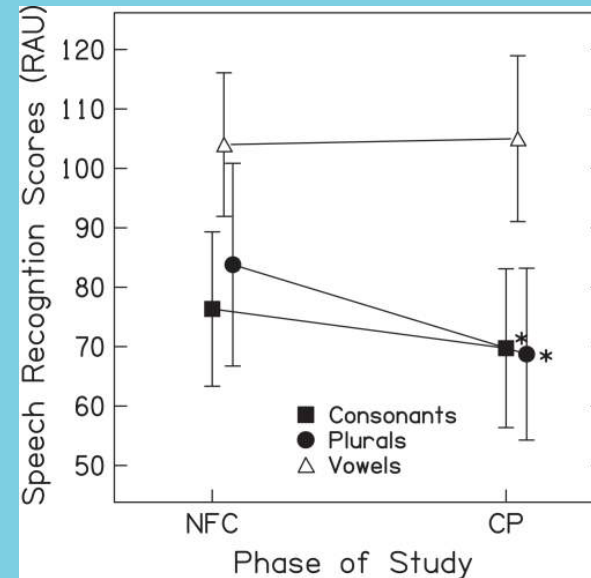
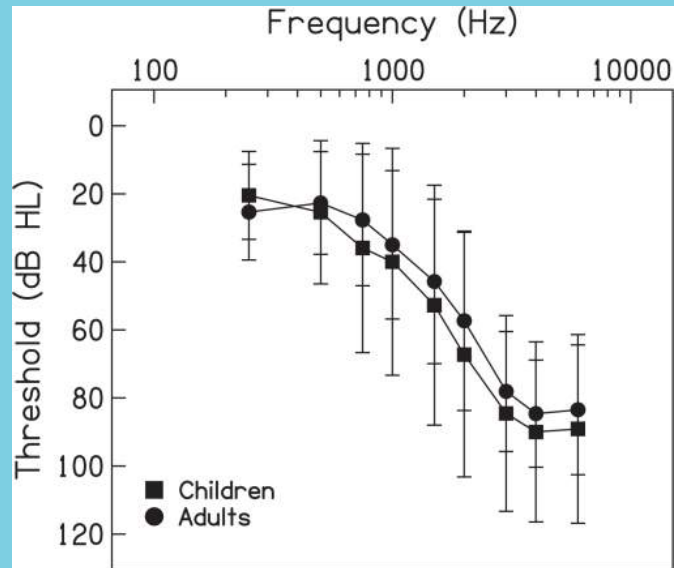
- Anti-feedback: ventilation possible
- Accurate fine-tuning slope in gain characteristics (many frequency bands)
- Frequency compression/transposition?



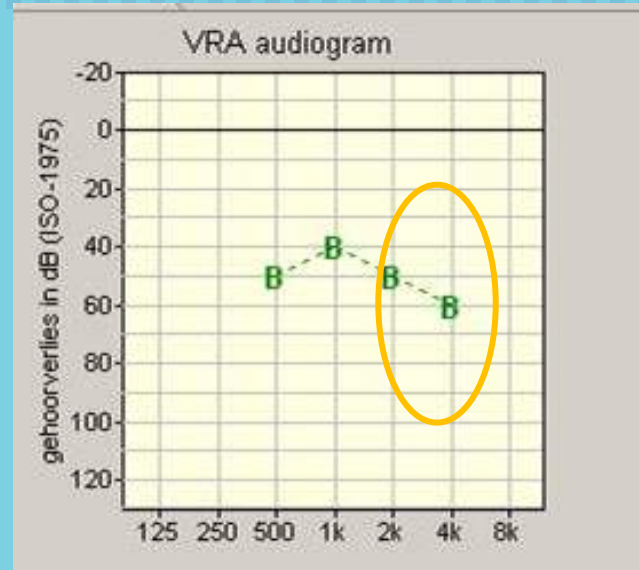
# Steep high-frequency losses

Glista et al. *IJA*. 2009 48 (642-664).

Effects of Frequency compression on speech perception



# Young children, infants



Improved audibility: compression, anti-feedback!

Role frequency compression?

## School Children

Adaptation to environment improves listening comfort

Directionality hardly any benefit.

Improved quality and connectivity FM-devices!



Small hearing aids = less visible.

However: often no connection solo, limited gain. Fixation open fitting often problematic.

# Elderly

Compression: no volume control needed!

Noise suppression: listening comfort, better acceptance.

One user program often sufficient.



# Money

Marktplaats - De plek om Nieuwe en Tweedehands spullen te kopen en verkopen - Windows Internet Explorer

http://www.marktplaats.nl/

MARKTPLAATS.NL Home | Nieuw | Help en contact | Mededelingen | Veilig handelen Zoek Uitgebreid zoeken

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Auto diversen  
Boeken  
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Cd's en Dvd's  
Computers en Software  
Contacten en Berichten  
Diensten en Vakmensen  
Dieren en Toebehoren  
Doe-het-zelf en Verbouw  
Fietsen en Brommers  
Hobby en Vrije tijd  
Huis en Inrichting  
Huizen en Kamers

**22 resultaten voor "hoortoestel"**  
Verwante zoektermen: hoortoestellen, hoorapparaat

Diversen (14)  
Zorg | Verpleegmiddelen en Hulpmiddelen (13)  
Zorg | Overige (1)




Telecommunicatie (1)  
Vaste telefoons | Niet Draadloos (1)

Sieraden, Tassen en Uiterlijk (1)  
Uiterlijk | Lichaamsverzorging (1)

Verzamelen (1)  
Elektronische Apparatuur (1)

Type advertentie  
Aangeboden (20)  
Gezocht (2)

Lijst Fotogalerij Kaart

		Prijs	Datum	Gezien	Locatie
	<b>Hoortoestel XtraVita AUDI</b> Het wordt de XtraVita AUDI genoemd die een doorbraak betekent omdat hij vrijwel net zo volmaakt functioneert als het menselijk oor Bovendien is deze AUDI zo klein dat hij...	€ 129,00	Vandaag	545	Bezorgt Ook In Leiden Bezoek website
	<b>Nu bij Postordershop: Hoortoestel Xtravita Audi</b> Bestel snel de Hoortoestel Xtravita Audi voor slechts 129 00 Over Ons Ontdek alles over Postorder Groep Nederland Als ervaren landelijk opererend postorderbedrijf zijn wij een...	€ 129,00	Vandaag	132	Bezorgt Ook In Leiden Bezoek website
	<b>Hoortoestel Sonic</b> Gehoorapparaat of hoortoestel Links en rechts 3 jaar oud De prijs is per stuk Kan bij verkoop ook in Groningen worden afgehaald	€ 25,00	Gisteren	4	Eeserveen, DR 172 km
	<b>oplader batterijen hoortoestel</b>	€ 80 00	15 mrt '10	9	Stellendam 7H

Internet | Beveiligde modus: uitgeschakeld 100%

Lokaal station (K) Microsoft PowerPoi... Marktplaats - De ple... EN 7:43



# Money

The hearing aid user often pays for extra features.

Trial: compare simple hearing aid with more advanced.

## Life style and environment

Dynamic : benefit advanced features

Inventory specific needs

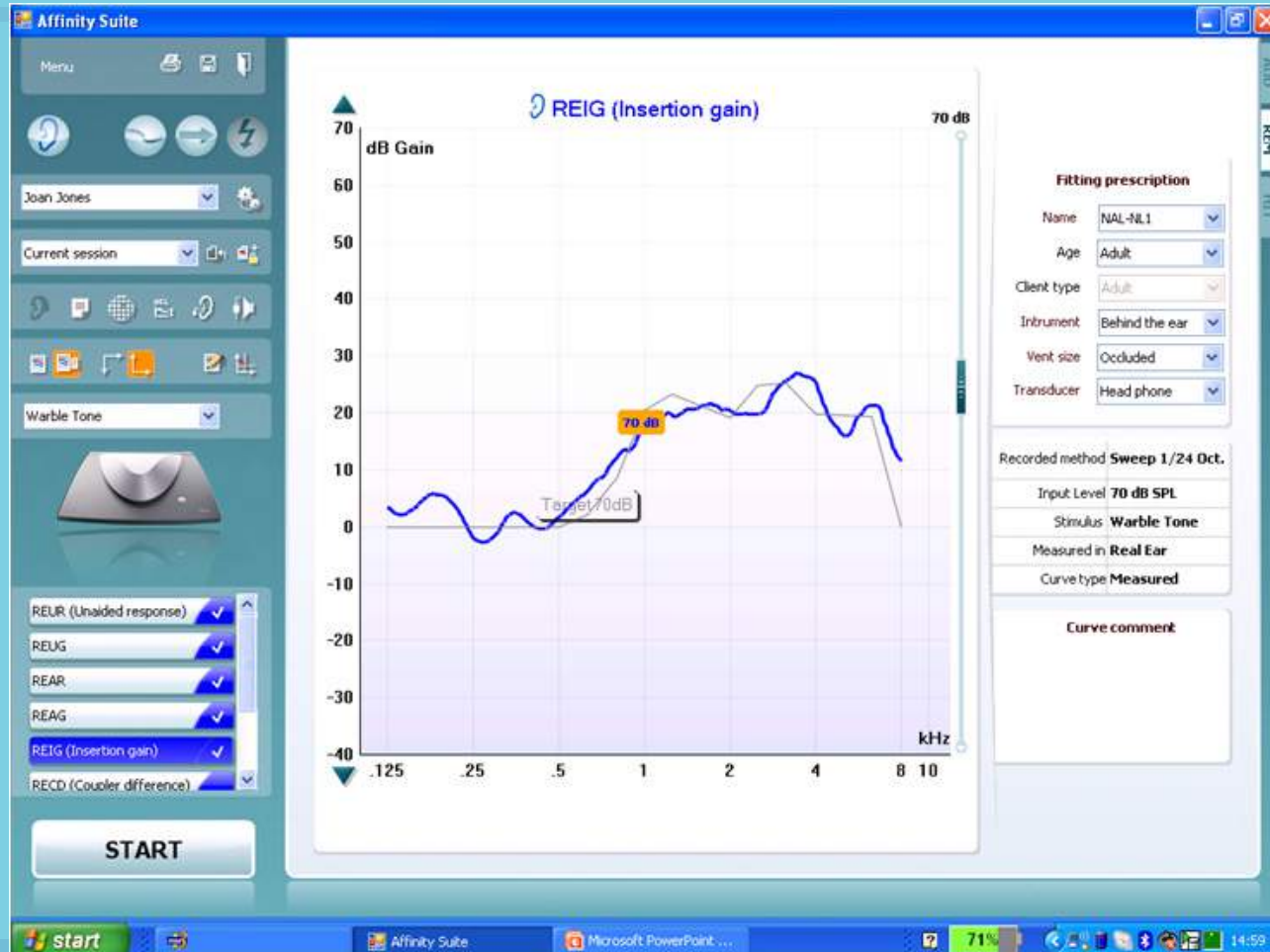


## How to fine-tune features to needs?

Clinical experience in combination with solid audiological background.

Advanced evaluation tools, still in development

# Evaluation: in-situ gain can still be used?



*Yes!!!*

# Evaluation: spatial hearing

**Geautomatiseerd richtinghoren - Nieuwe meting**

95 dB  
I: dir sounds  
O: Telefoon

95 dB  
I: dir sounds  
O:

Aangeboden op speaker

1 2 3 4 5 6 7

1 2 3 4 5 6 7

Waargenomen op speaker

Algemeen: Indeling - (7) 5 dB

Tijd vertraging: 3 sec 9 sec

Geluidsvariatie: 4 dB 6 dB

Achtergrond geluid: 50% 95 dB

Target geluid: dir sounds 95 dB Telefoon 3

Aanbieden\Grafiek

Sneltoetsen Opmerkingen

Volgende >>

Implementations from stichting PACT

Start p271268 Persoon Decos Audiology - Patiën... Geautomatiseerd rich... Geautomatiseerd richting... 41 Jaar 04 15:51

*Important!!!*

## Conclusion

Many new features in hearing aids last decade

Reason to be sceptical (‘good’ Dutch tradition)?

Yes, limited evidence for benefit.

No, many practical advantages and improved listening comfort,  
leads to improved auditory functioning

