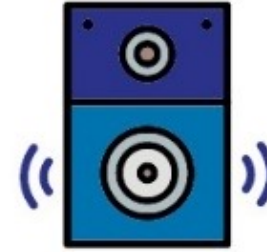


RSA VERSION

Acceptable Noise Level (ANL) Test

ANL



«english»

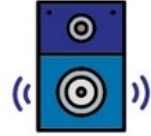
ANL



«afrikaans»



ANL



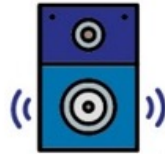
Introduction

ANL



Why

ANL



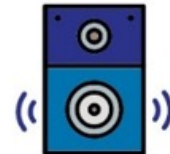
What Who How

ANL



Scoring and Interpretation

ANL



Rehabilitation

Agenda a



Family of Recorded Speech Audiometry material

TEST	TYPE OF NOISE	ADAPTIVE/FIXED SNR
	Multi-talker adult babble noise	Fixed +10 & +5 dB SNR
	Multi-talker adult babble noise	Fixed +10 & +5 dB SNR
	Multi-talker adult babble noise	Fixed +10 & +5 dB SNR
 	Multi-talker adult babble noise	Adaptive SNR

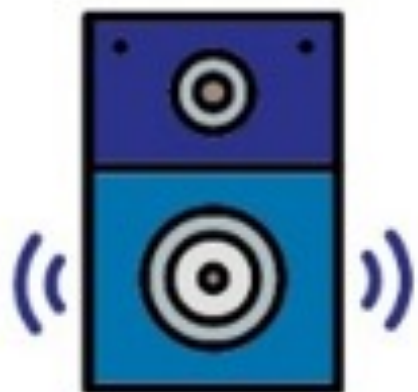


Family of Recorded Speech Audiometry material

TESTS	TYPE OF NOISE	ADAPTIVE/FIXED SNR
 	Multi-talker adult babble noise	Fixed +5, 0 dB SNR and Adaptive SNR
 	Children's classroom noise Competing children's reading speech	Fixed 0, +5, +10 dB SNR Adaptive SNR
 	Children's classroom noise	Adaptive SNR



ANL



Introduction



Developed by Dr AK Nabelek in
1991 (University of Tennessee,
Knoxville)

“Toleration of background
noises: Relationship with
patterns of hearing aid use by
elderly persons” (*Journal of
Speech, Language and Hearing
Research*)

Dr Patrick Plyler, PhD
(University of Tennessee)



References

[20Q: Acceptable Noise Level Test - The Basics and Beyond](#)

Presented by Patrick N. Plyler, PhD, CCC-A 

[20Q: Acceptable Noise Level Test - Supporting Research and Clinical Insights](#)

Presented by Patrick N. Plyler, PhD, CCC-A 

The Acceptable Noise Level Test as a predictor of real-world hearing aid benefit. Taylor, Brian. The Hearing Journal: Sept 2008 – vol 61 – issue 9.

2000 – 2015 > 50 published articles



ANL



Why



Goals of ANL test

To assess a patient's acceptance/tolerance for background noise

Determine success of hearing aid outcome

To predicting the pattern of hearing aid use (full/part/none)

Guidelines for rehabilitation strategies beyond the hearing aid fitting



Who is successful h/a users?



President Trump

ANL score = 3



Queen Elizabeth

ANL score = 13





Which factors will attribute to successful hearing aid use?

- Amount of daily hearing aid use?
- Family's feedback?
- Patient's own report?
- Patient who purchased the premium range?
- Early intervene?
- Good speech perception skills?
- Better degree of hearing loss?
- Tolerance & acceptance for background noise?





Nabelek et al (2006) n = 191 JAAA

RESULTS:

ANL score is related to hearing aid use

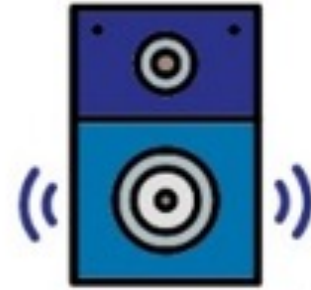
Low ANL score (tolerate noise well) → full-time users

Full-time users = successful hearing aid users

**UNAIDED ANLs COULD PREDICT HEARING AID
SUCCESS WITH 85 % ACCURACY**



ANL



What Who How



ANL – What?

Easy and quick (10min) speech-in-**noise** test
(NOT speech perceptual test)

Willingness to listen in background noise will be more indicative of **hearing aid use** than actual speech understanding (Plyler, 2015A)

Not related & no significant correlation between ANL and speech-perception-in-noise tests (SPIN, HINT, QuickSIN)



Factors not influencing ANL test

- Age of patient
- Sex of patient
- Degree of hearing loss
- Background noise preference





Who are we going to test? Those who.....

- have difficulty to concentrate in noise more than in quiet
- have increased stress levels in noisy situations more than in quiet
- have difficulty to understand speech in noise more than in quiet
- find background noise bothersome
- have intolerance for background noise
- avoid background noise situations (Recker et al., 2011)
- are diagnosed with ADHD and ADD (Freyaldenhoven et al, 2005)
- have misophonia & hyperacusis



Content - RSA Recording

1. Instructions very *IMPORTANT*
2. Running speech
South-African Male reading a
passage “A trip through South Africa”
& “Ons reis deur Suid-Afrika”
3. Multi-talker babble noise





Content of ANL

Ensure:

- (P) understands instruction 1
- Audiologist switch on the running speech in channel one
- Increase the dB in 5 dB steps
- Decrease in 5 dB steps
- $\uparrow$ & $\downarrow$ 2 dB steps to find the MCL for running speech

	1	2
Running Speech Levels		
Too loud	dBHL	dBHL
Too soft	dBHL	dBHL
MCL	dBHL	dBHL
Noise Levels		
Too loud	dBHL	dBHL
Very clear	dBHL	dBHL
BNL	dBHL	dBHL
ANL		
ANL = MCL - BNL		
Average ANL		



Sound example of Instructions 2





Sound sample



Content of ANL

Ensure:

- (P) understands instruction 2
- Audiologist switch on the multi-talker babble noise in channel two
- Increase noise the dB in 5 dB steps
- Decrease noise in 5 dB steps
- Found the highest background noise level that is acceptable/tolerable/can put up with.....while listening to and following the story
- $\uparrow$ & $\downarrow$ 2 dB steps to find the BNL

	1	2
Running Speech Levels		
Too loud	dBHL	dBHL
Too soft	dBHL	dBHL
MCL	dBHL	dBHL
Noise Levels		
Too loud	dBHL	dBHL
Very clear	dBHL	dBHL
BNL	dBHL	dBHL
ANL		
ANL = MCL - BNL		
Average ANL		



ANL – Set-up

Two channel audiometer (Nabelek et al, 2004 & 2006)

	CHANNEL ONE	CHANNEL TWO
Stimulus	Int/Ext A	Int/Ext B
Transducer	Speaker	Speaker
Routing	Right	Right
Interrupt	“On” to determine most comfortable level (MCL) for running speech	“On” to determine background noise level (BNL) of multi talker babble noise



ANL – Set-up

Two channel audiometer



Testing conducted in sound booth with a sound field speaker placed at 0 degrees azimuth to the patient
Headphones/inserts: R&L in channel one, R&L in channel two. Both speech and noise should be presented to both ears (Frye Electronics, Inc).



How to
determine
the ANL
score?

	1	2
Running Speech Levels		
Too loud	dBHL	dBHL
Too soft	dBHL	dBHL
MCL	dBHL	dBHL
Noise Levels		
Too loud	dBHL	dBHL
Very clear	dBHL	dBHL
BNL	dBHL	dBHL
ANL		
ANL = MCL - BNL		
Average ANL		



ANL



Scoring and Interpretation





Scoring: Three Categories (Plyler, 2015)

- Low score (≤ 7 dB)
- Mid score (8 - 12 dB)
- High score (≥ 13 dB)



Interpretation of ANL scores

Low score (≤ 7 dB)

- High tolerance for background noise
- Likely to be successful hearing aid wearers
- Likely to wear hearing aids on a regular basis and become full-time users (Nabelek et al, 2006)



Interpretation

Mid score (8 – 12 dB)

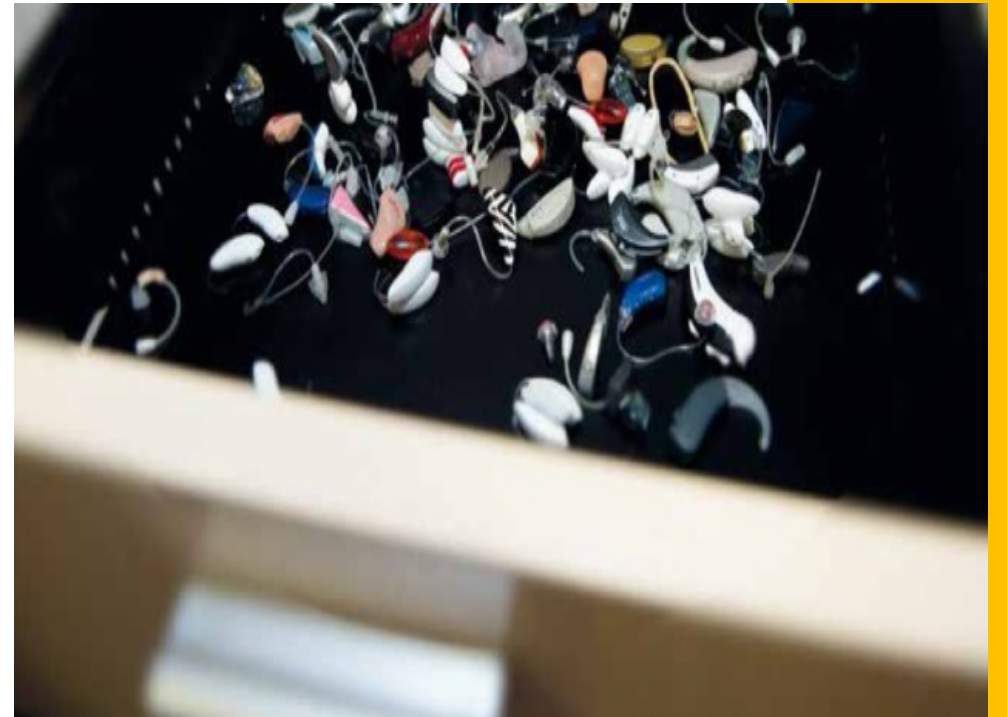
- May or may not be successful with hearing aids
- Good (8) or bad (12) prognosis for regular use and acceptance of hearing aids
- Prediction for hearing aid use is unclear (Nabelek et al, 2006)
- May require more follow-up counselling



Interpretation

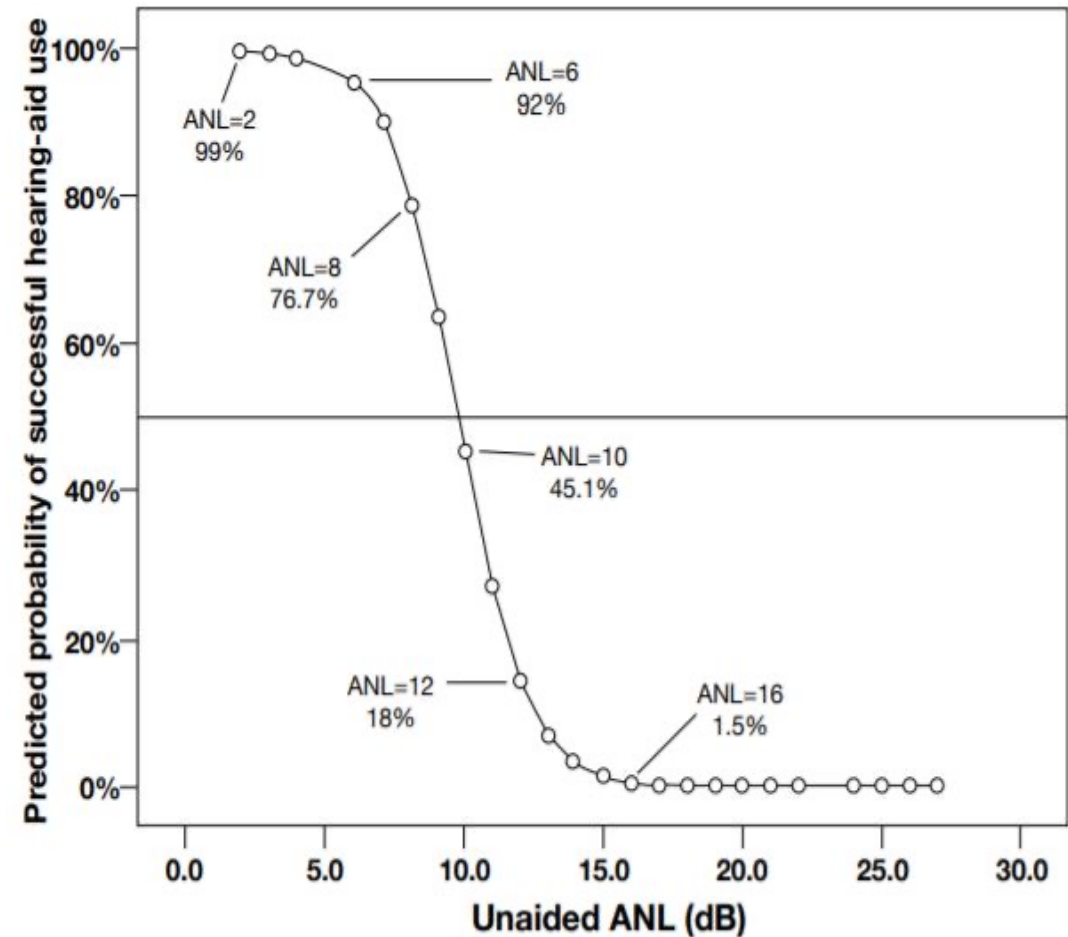
High score ≥ 13 dB

- Low tolerance for background noise
- “At risk” for reduced utilization of hearing aids
- Less likely to wear hearing aids regularly (Nabelek et al, 2006)
- Willing to listen at high / good SNRs
- Require additional post-fitting counselling, guidance & aural rehabilitation



Interpretation

- Find the patient's unaided ANL score on the "S curve". Then locate the corresponding probability on the y-axis. This prediction has an 85% accuracy (Fry Electronics, Inc.).
- ANL score of 8, there is a 76,7% probability that he/she will be a successful hearing aid user.



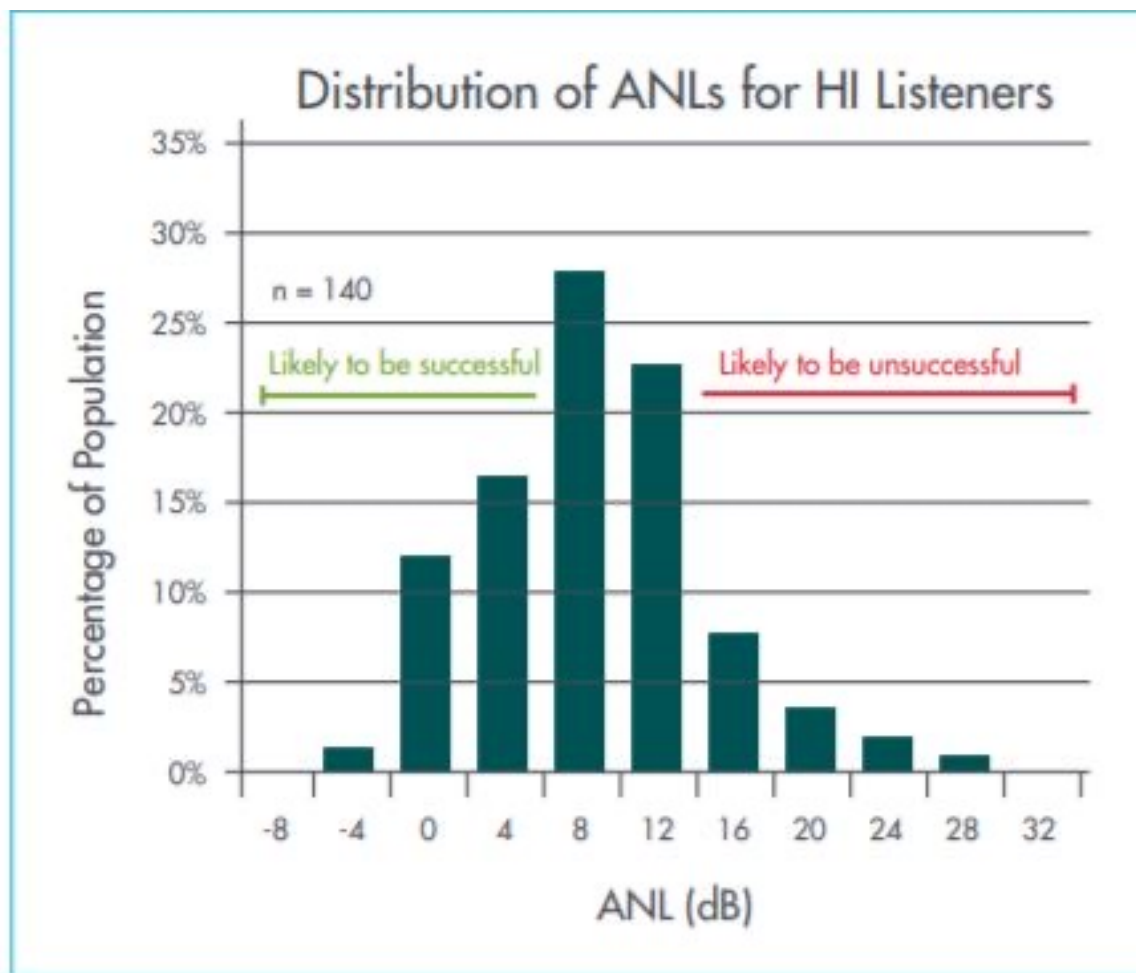


Figure 1: ANLs for HI listeners. Arrows on the graph indicate whether the individuals would likely be successful or unsuccessful with hearing aids.

Results n = 140
Hearing Impaired
people
Recker & Edwards
(2015)



Which one is a successful h/a user?



President Trump

ANL score = 3 dB



Queen Elizabeth

ANL score = 13 dB



Case study 1 (Mrs S - 41 Years)

High ANL score of 15 dB

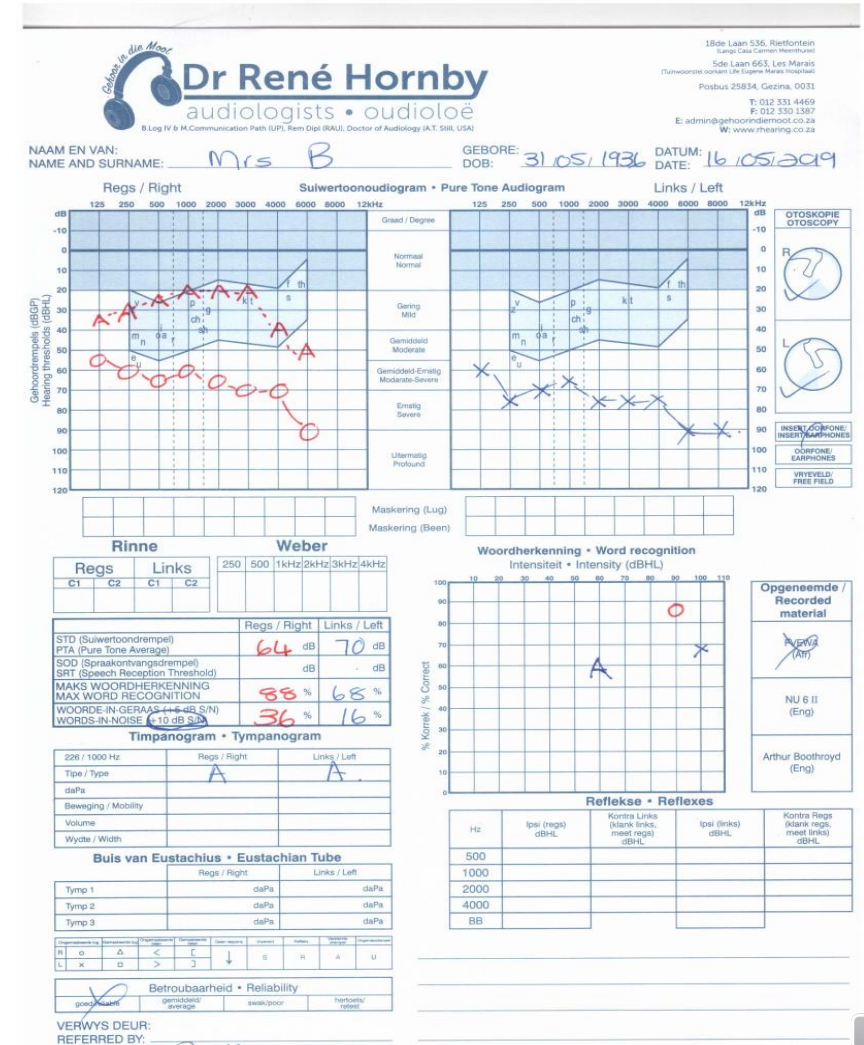
- Misophonia - chewing, nail ticking
- Hyperacusis – any noise
- Normal peripheral hearing sensitivity, normal immittance measurements & present within normal limits DPOAEs
- Intolerant towards noise
- Treatment strategies for misophonia



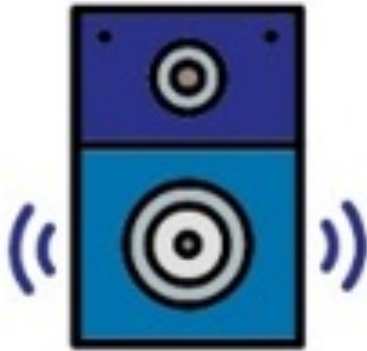
Case study 2: Mrs B - 84 years

ANL score of 13 dB (high)

- Long time hearing aid user
- Full time user
- One on one conversations
- Difficult hearing in groups & dining room
- Difficulty hearing over distance (church)



ANL



Rehabilitation



How do we Rehabilitate?

- Digital noise reduction (DNL)
- Directional microphones can improve the ANL by approximately 4 dB (Lowery & Plyler, 2013)
- Remote microphones (streaming)
- Improving sound tolerance using Tinnitus Retraining Therapy
- Environmental adaptations/modifications
- Auditory training to develop a physiological change in noise acceptance (Plyler, 2015 B)



How can
new
technology
help? We've
asked the
experts.....

GENERAL FEATURES

- Extended bandwidth of 12kHz
- Wide input dynamic range of 108dB = natural input and clear signal
- Automatic switching of parameters





How can new technology help? We've asked the experts.....

NOISE REDUCTION & MICS

- Automatic mic directional beam
- Multichannel multimicrophone features = focus on speech and better SNR
- Soft level noise reduction
- Adaptive directionality & dynamic noise cancellation
- Aggressive gain reduction for “noisy” inputs
- Impulse noise reduction
- Directional focus – app
- Reverse focus
- Better speech understanding = less effort





But.....

- Verification very important
 - Ensure speech audibility
- 



THANK YOU FOR
LISTENING TO
“NOISE”

QUESTIONS?

rhornby@lantic.net

