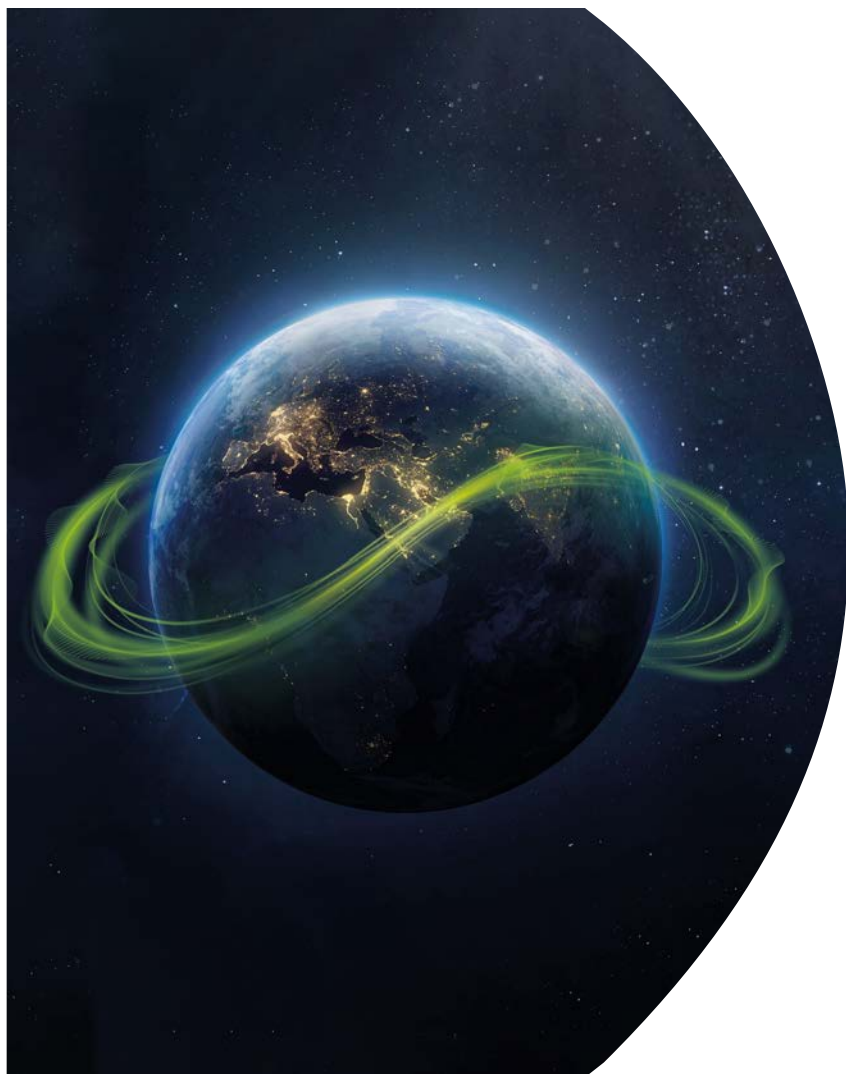


The science supporting Infinio

Sarah Dyke, AuD

Webinar FAQs

- **How to ask a question:**
 - Click Q&A, type your question and Send.
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 - Resources in the classroom and under Pending Courses in your account
- **How to view captions:**
 - Click Live Transcript CC button
 - Click Show Subtitle
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 - After the webinar, go to your Pending Courses and pass the multiple-choice exam.
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 - Call 800-753-2160
 - customerservice@audiologyonline.com
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PHONAK
life is on

The science supporting Infinio.

Sarah Dyke, AuD

Speaker



Financial disclosure: Speaker is employed by Phonak US

Non-financial discloser: None

Risks/Benefits



- The applicability and accuracy of the course content may vary by the clinical, geographical, and cultural context; you should evaluate the course accordingly.
- As healthcare is rapidly evolving, new findings may change the validity of the information presented in this course. Providers should always consult the latest research and guidelines from professional associations.
- The interventions discussed in this course may be limited in generalizability, requiring practitioners to consider specific individual and population factors.
- The course may not cover all possible risk factors, diagnostic methods, or treatment options, and complex cases may require additional considerations.
- Healthcare providers should apply cultural competence and sensitivity to ensure effective and respectful care based on their patients' diverse needs.
- Providers should always evaluate the limitations of diagnostic and screening tools, considering their potential for false results as well as any ethical implications.
- It is the responsibility of course participants to critically evaluate the evidence from multiple sources to guide professional practice.



Learning Outcomes

After this course, participants will be able to:

- Describe how Phonak's approach to DNN is unique to the industry
 - List the products that features Spheric Speech Clarity
 - Describe the benefit of Infinio features to your patients
- 

Infinio

Exceptional
sound quality
from the first
moment.



Connectivity
you can
count on.



**Tested.
Reliable.
Proven.** Swiss
engineering at
its best.



Personalized
for you and
your patients.



Clear speech
from any
direction **with**
**Spheric
Speech
Clarity.**



Infinio

**Exceptional
sound
quality
from the
first moment**





First impressions count

In clinic



At home

Adaptive Phonak Digital: 19 years of continuous improvement



**Savia
2005**

Introduced
Adaptive Phonak
Digital for the first
time



**Marvel
2018**

Reduced high
frequency gain



**Paradise
2020**

Adaptive
compression
speeds, linearized
high level gain and
new pre-calculation
for mild-moderate
loss



**Infinio
2024**

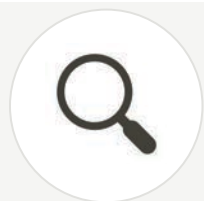
New frequency
response curves



Some of the best
discoveries **are**
by accident



Study to improve streamed sound quality



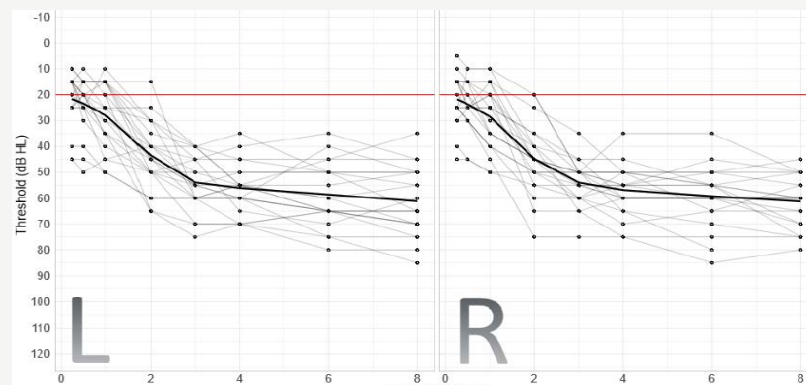
Study objectives

Primary:

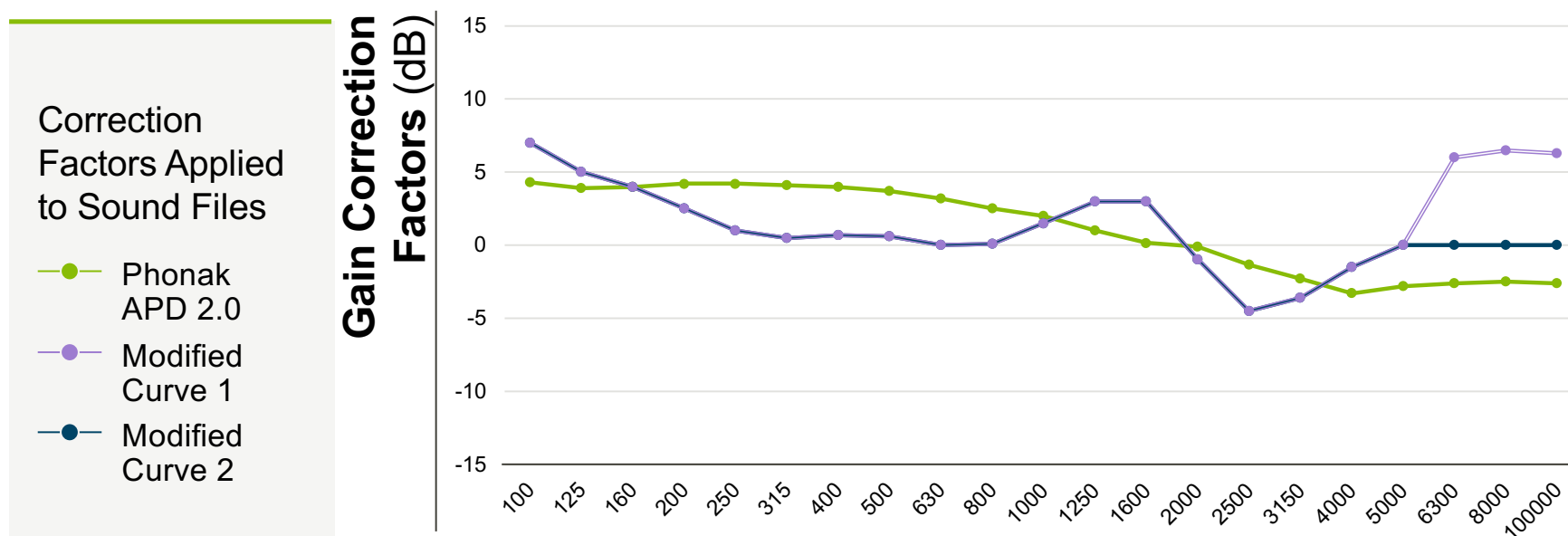
investigate effect of head-phone based frequency response on listener preference of streamed signal

Study details

- 24 subjects
- 12 male, 12 female
- Experienced



Modified frequency response curves and music genres used



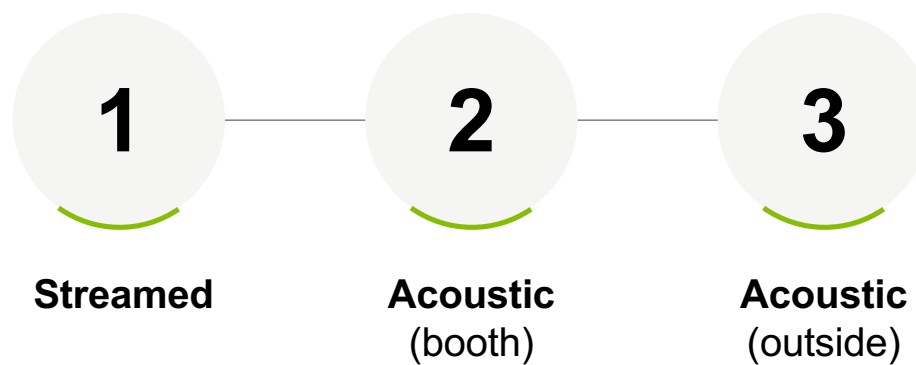
Modified frequency response curves and music genres used

Genre



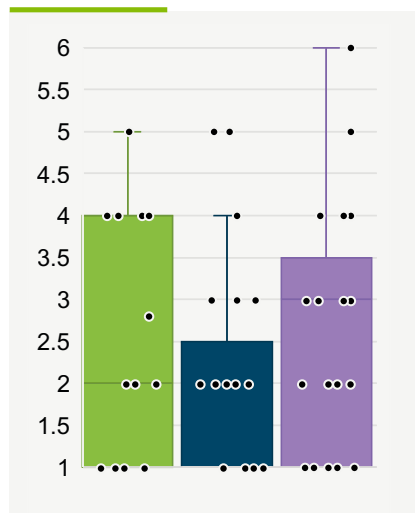


Music stimuli presented under three test conditions

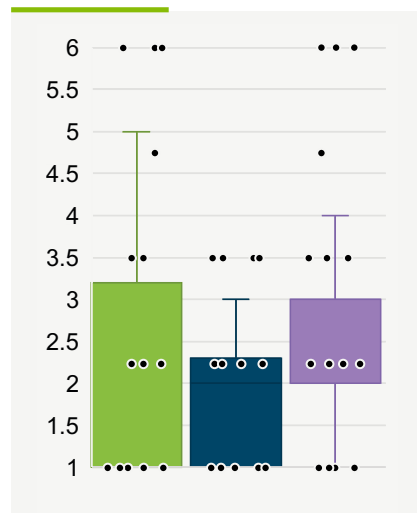


Streamed condition results were inconclusive

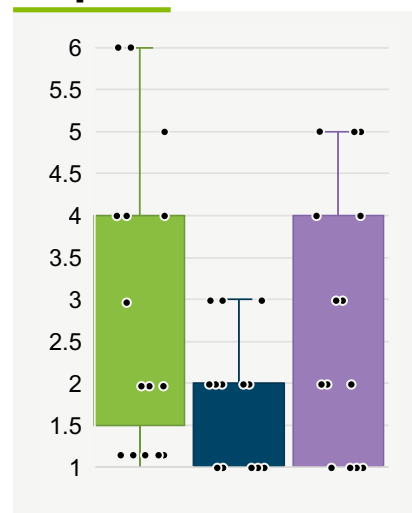
Classical



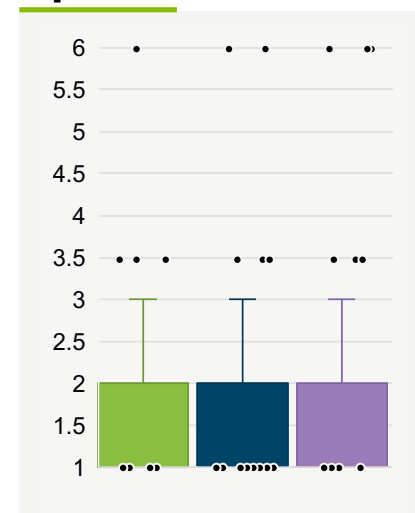
Jazz



Pop

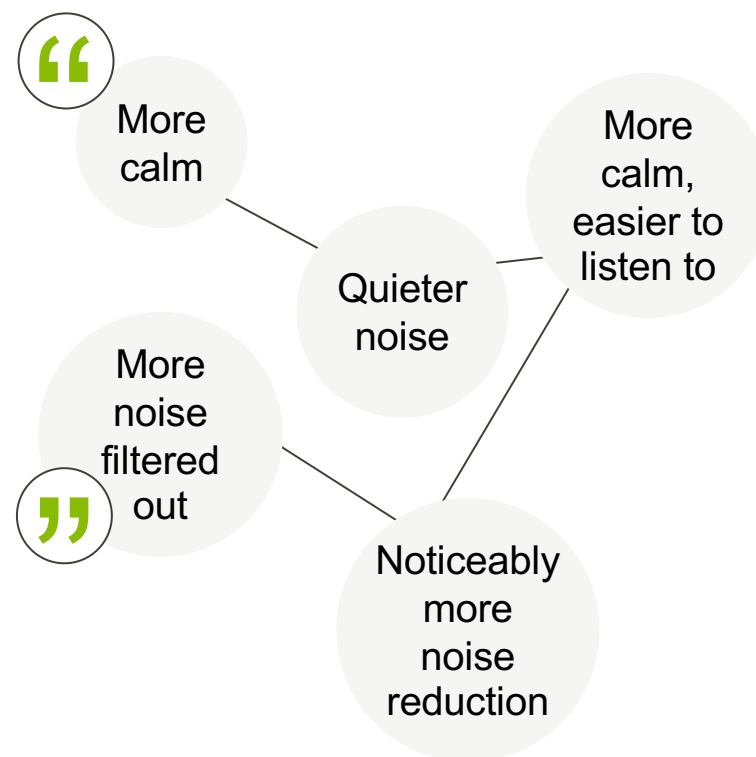
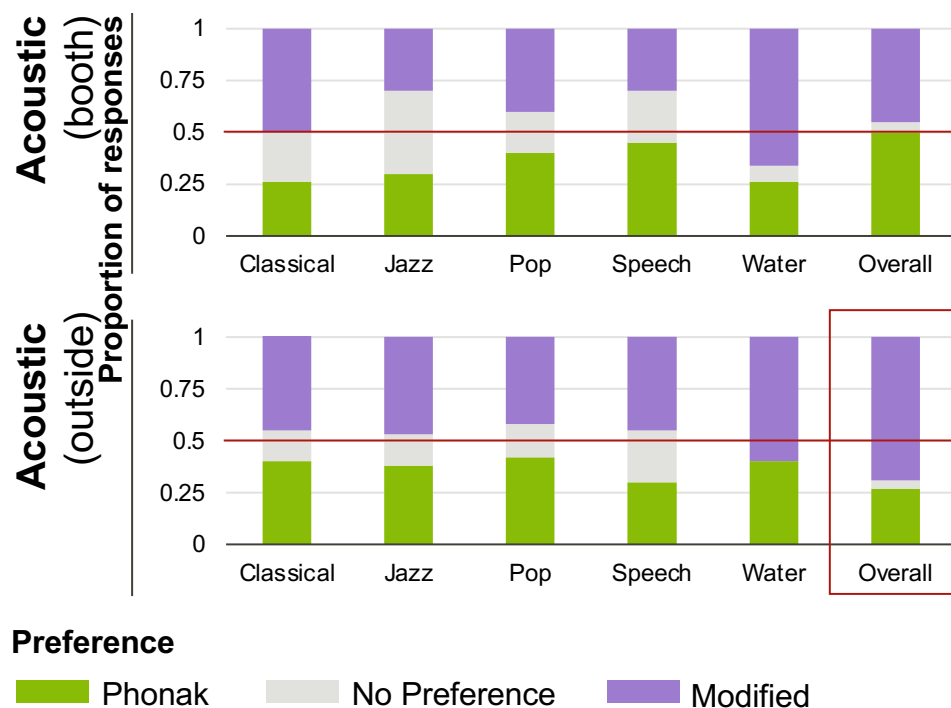


Speech



■ Phonak APD 2.0
 ■ Modified curve 2
 ■ Modified curve 1

Promising results in acoustic outside condition



Study results point towards benefit in acoustic situations



Streamed

Unclear: Equal distribution across all three (APD 2.0, and both modified versions)



**Acoustic
(booth)**

Unclear: no significant difference between APD2.0 and modified



**Acoustic
(outside)**

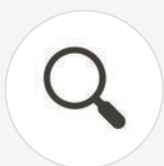
Clear preference for modified frequency response

Infinio sound quality with a new APD



**New
APD?**

Study to improve the acoustic and streamed sound quality of Phonak APD



Study objectives

Primary:

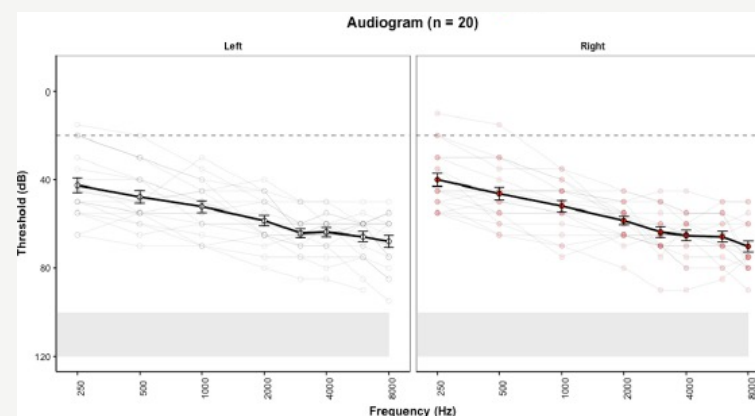
Investigate effect of a 2-4kHz gain reduction and a 1kHz gain boost on **comfort/ noise intrusion, speech clarity maintained and overall preference.**

Secondary

Can we improve the **streaming sound quality** with new frequency response inspired by Sennheiser HD600 sound quality

Study details

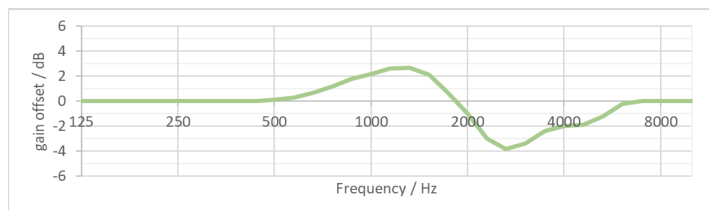
- 20 subjects
- 10 male, 10 female
- Experienced



Different frequency curves were identified and tested

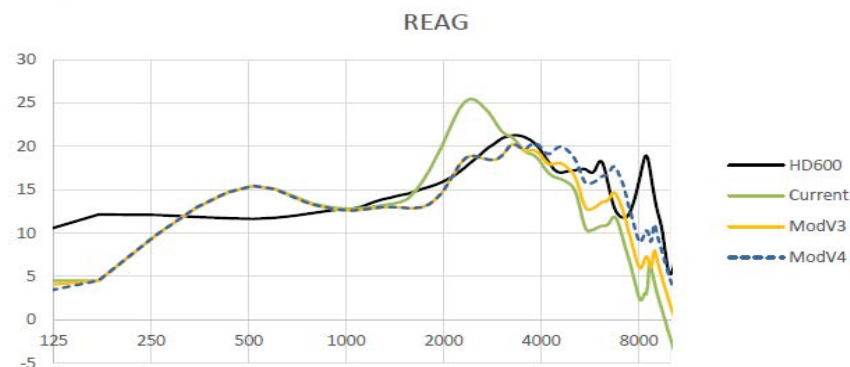
1

Investigate new frequency offset for acoustic programs

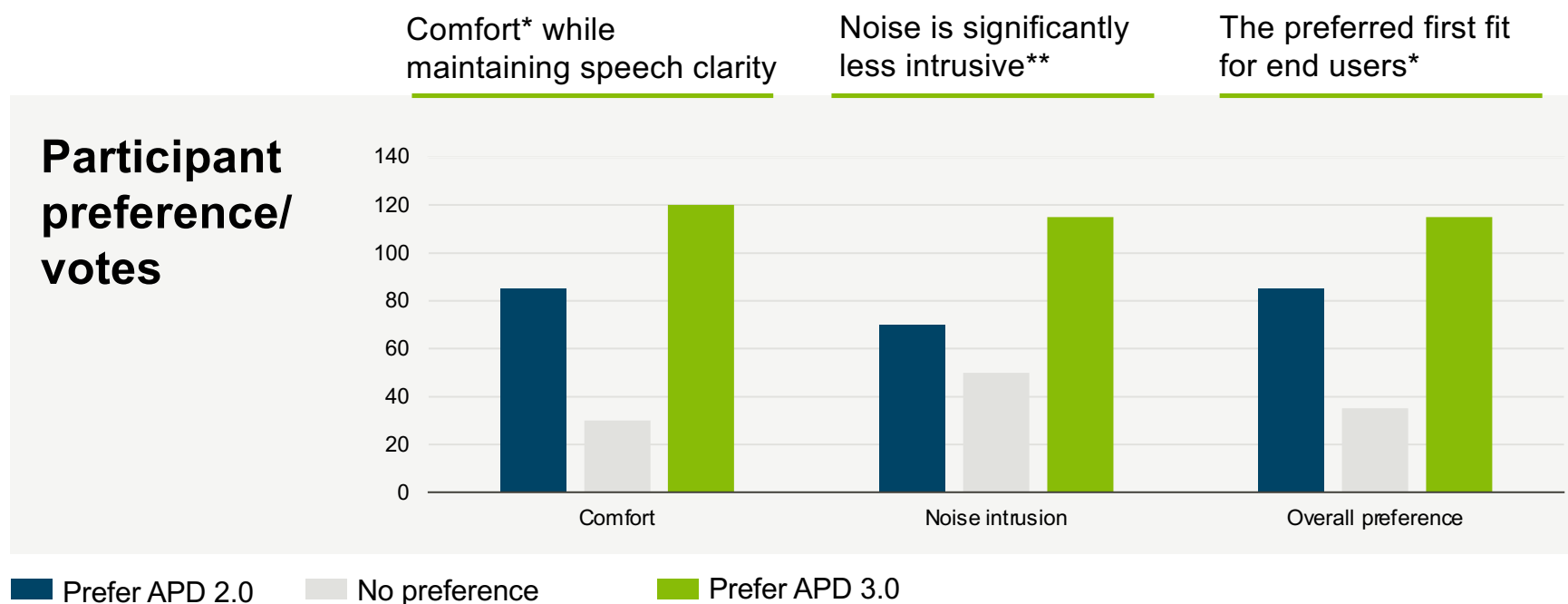


2

Investigate 2 new frequency curves for streaming program based on commercially available Sennheiser headphone HD600

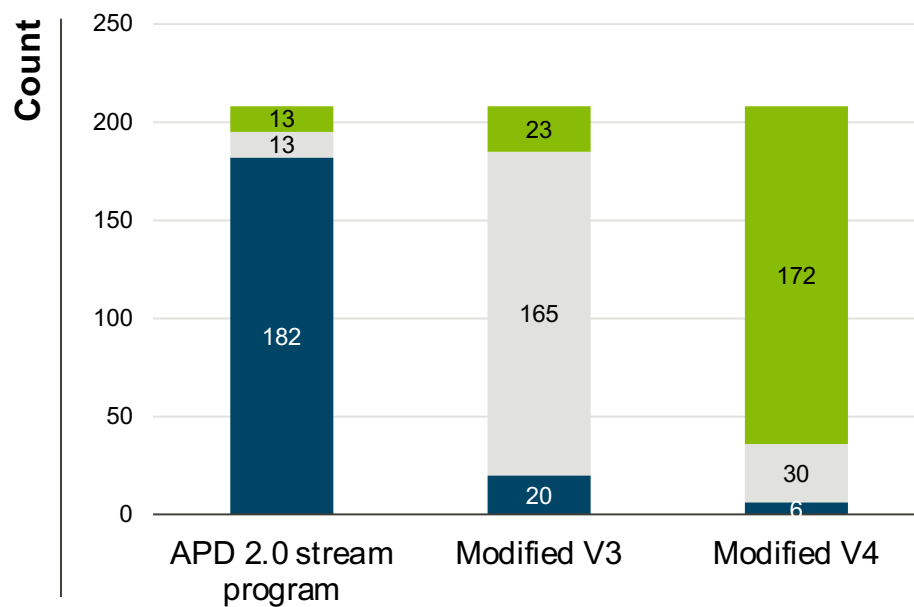


APD 3.0 clearly preferred over APD 2.0 in all categories



* Compared to APD2.0 | N= 20 participants | ** As rated by end users in a study comparing APD3.0 to APD 2.0

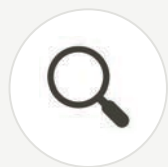
Modified frequency curve rated highest for streamed sound quality



13 Expert listeners Sound survey

- 1** Highest sound quality
- 0** Neutral
- 1** Lowest sound quality

Study to compare APD 3.0 with key competitor device



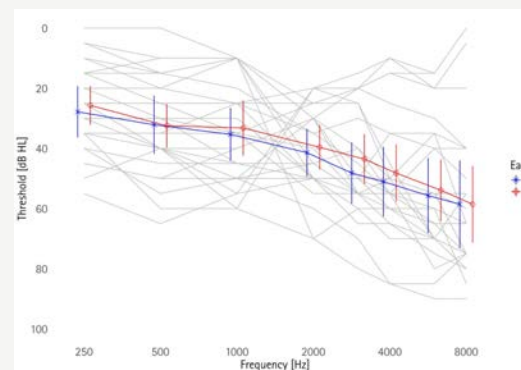
Study objectives

Primary:

Compare the sound quality and overall preference of APD 3.0 to the first fit prescription of a key competitor.

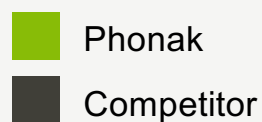
Study details

- 15 subjects
- 7 male, 8 female
- First time

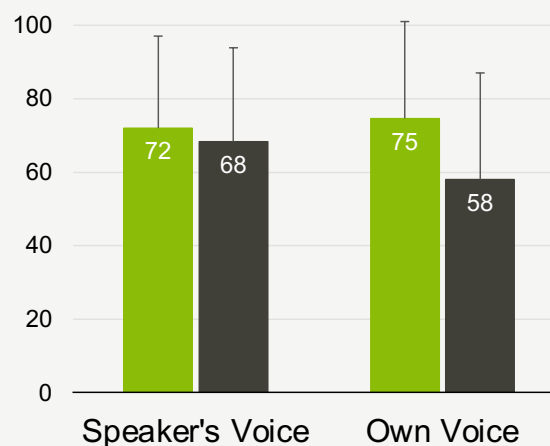


APD 3.0 rated higher for first fit loudness and sound quality

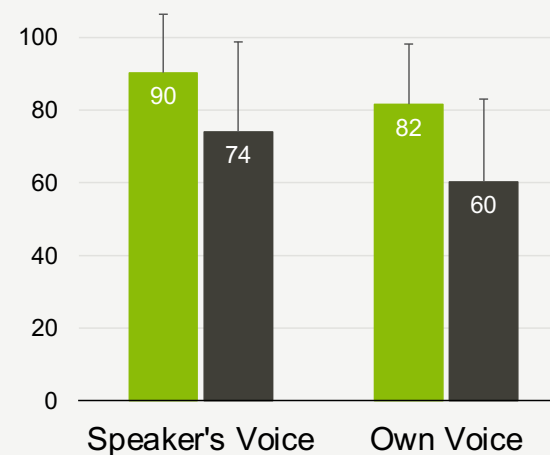
Satisfaction Rating



First Fit Loudness



First Fit Sound Quality





**Overall
preference**
shows that first
fits are not all
equal.

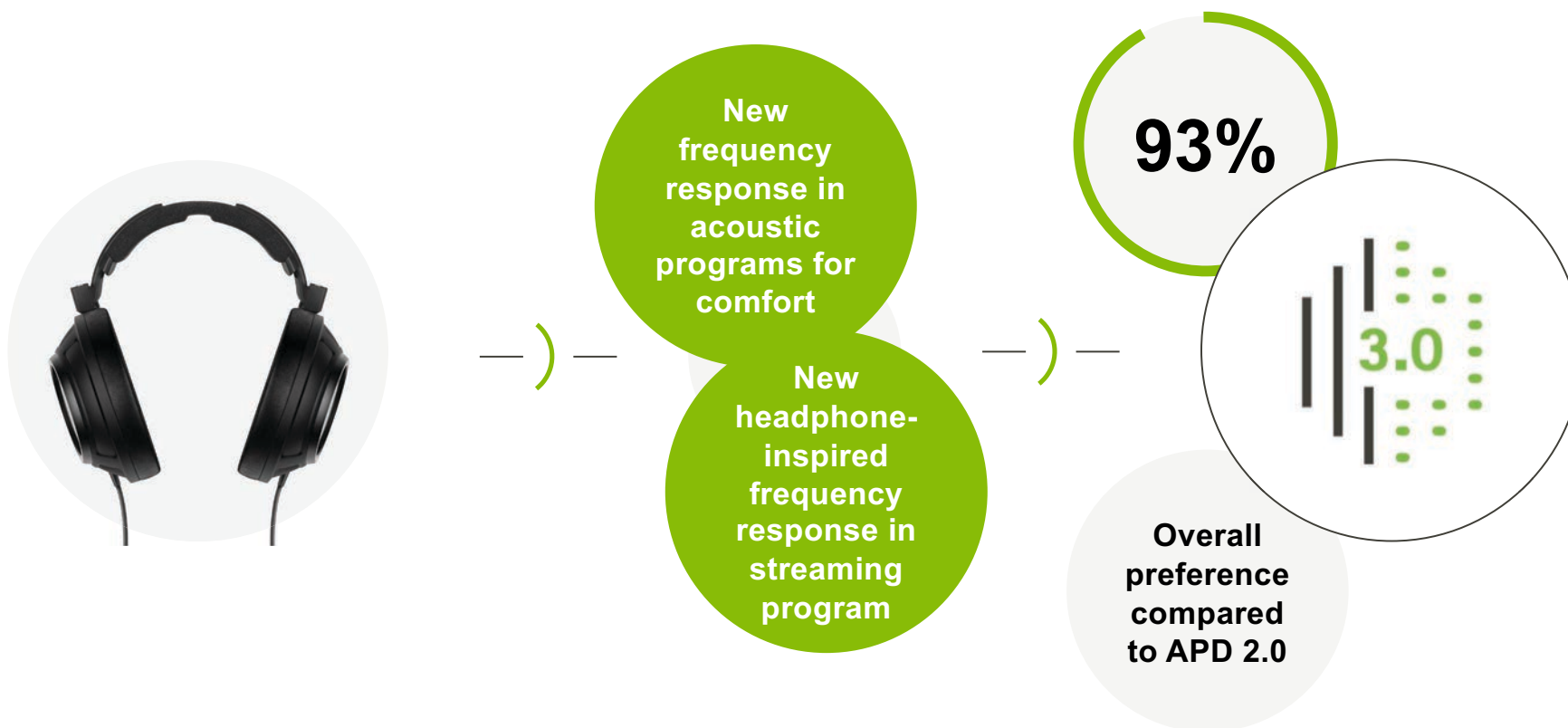


93%

Consumer satisfaction
from the very first fit
compared to a key
competitor device*

* Stewart, E., Adler, M., Seitz-Paquette, K., "Adaptive Phonak Digital (APD) 3.0 is the preferred first fit compared to a leading competitor device".
Phonak Field Study News in preparation expected August 2024

Journey of discovery leading to APD 3.0





First impressions count

In clinic



At home

Difficulties listening in quiet is a key indicator of hearing aid benefit



of time is spent listening
in calm situation
environments*



Fatigue

Listening effort

* Phonak Datalake Fitting Data extrapolated on 14th May 2024 for Phonak Lumity users with usage time, in the US.

Can Speech Enhancer reduce fatigue in quiet environments?



Study objectives

Primary:

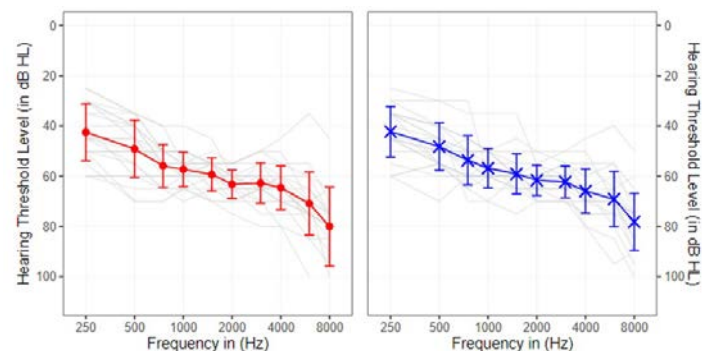
Evaluate whether Speech Enhancer provides less listening effort in a series of situations with distant/soft speech **resulting in less fatigue** at the end of a simulated day

Secondary:

- Evaluate whether Speech Enhancer provides a higher continuous **memory capacity** of comprehended speech
- Evaluate **reaction time, concentration and word memory**

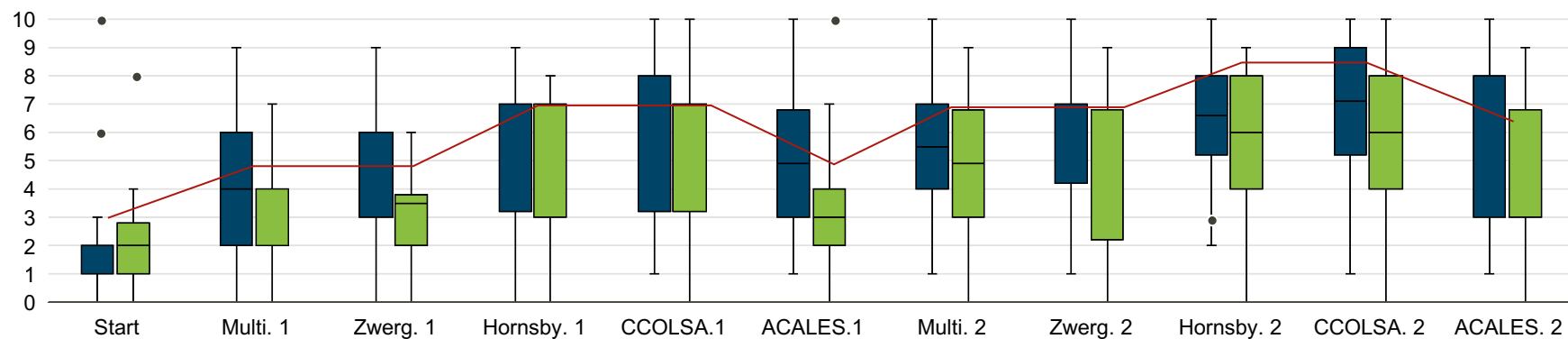
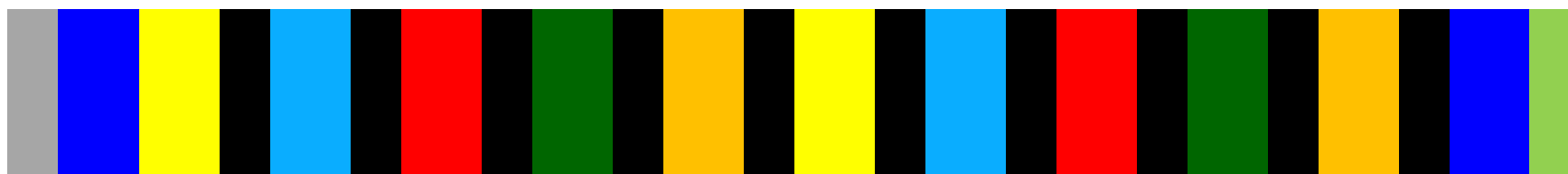
Study details

- 22 subjects
- 12 male, 10 female
- Experienced

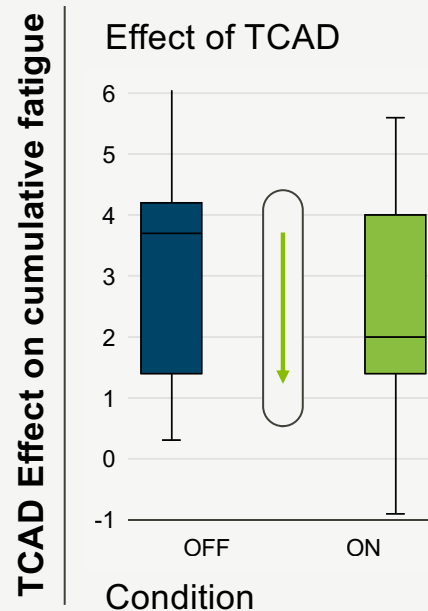
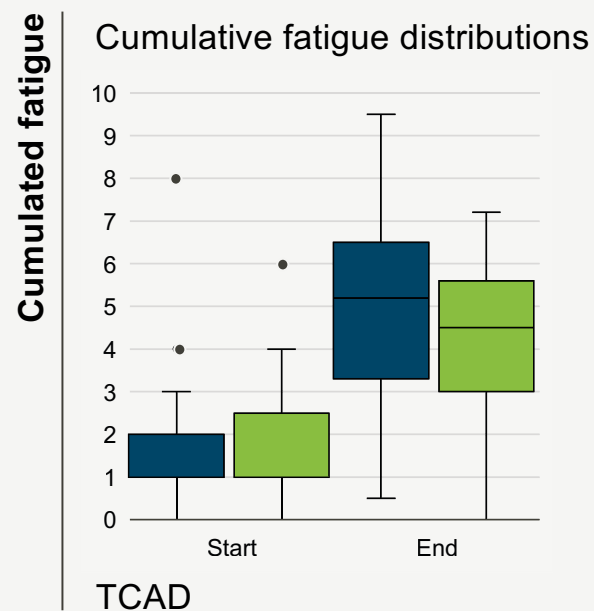




TCAD – Time compressed auditory day concept



Speech Enhancer reduces fatigue



21%
less fatigue

Condition
■ ON ■ OFF

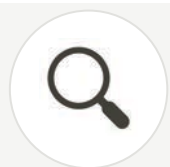
Speech Enhancer improves memory and comprehension



**Significantly
improved**
memory and
comprehension

Condition
ON OFF

EEG study to look at effect of Speech Enhancer on listening effort



Study objectives

Primary:

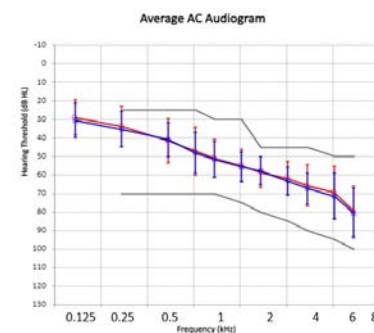
To investigate if activated Speech Enhancer (SE) in a **Listening Effort Task (LET)** causes a **reduction of the electro-encephalography (EEG) alpha power**.

Secondary

Investigate if activated Speech Enhancer provides less listening effort with speech from **a distance** (4m) and from **an adjacent room**.

Study details

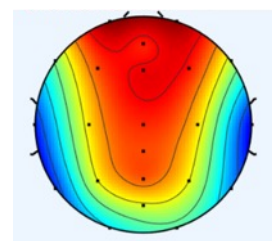
- 27 Participants
- 13 male, 14 female



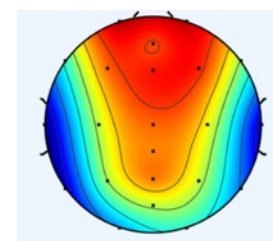
EEG and speech from a distance test conditions

1

Focused on the activity in the alpha EEG frequency band (7 to 13 Hz). The brain activity was recorded from 24 electrode sites mounted into a custom-made elastic EEG cap



Speech
Enhancer



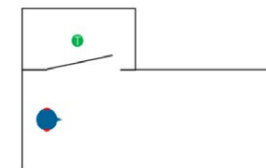
Speech
Enhancer

2

Listening effort measured in two conditions; 4 meters and from adjacent room

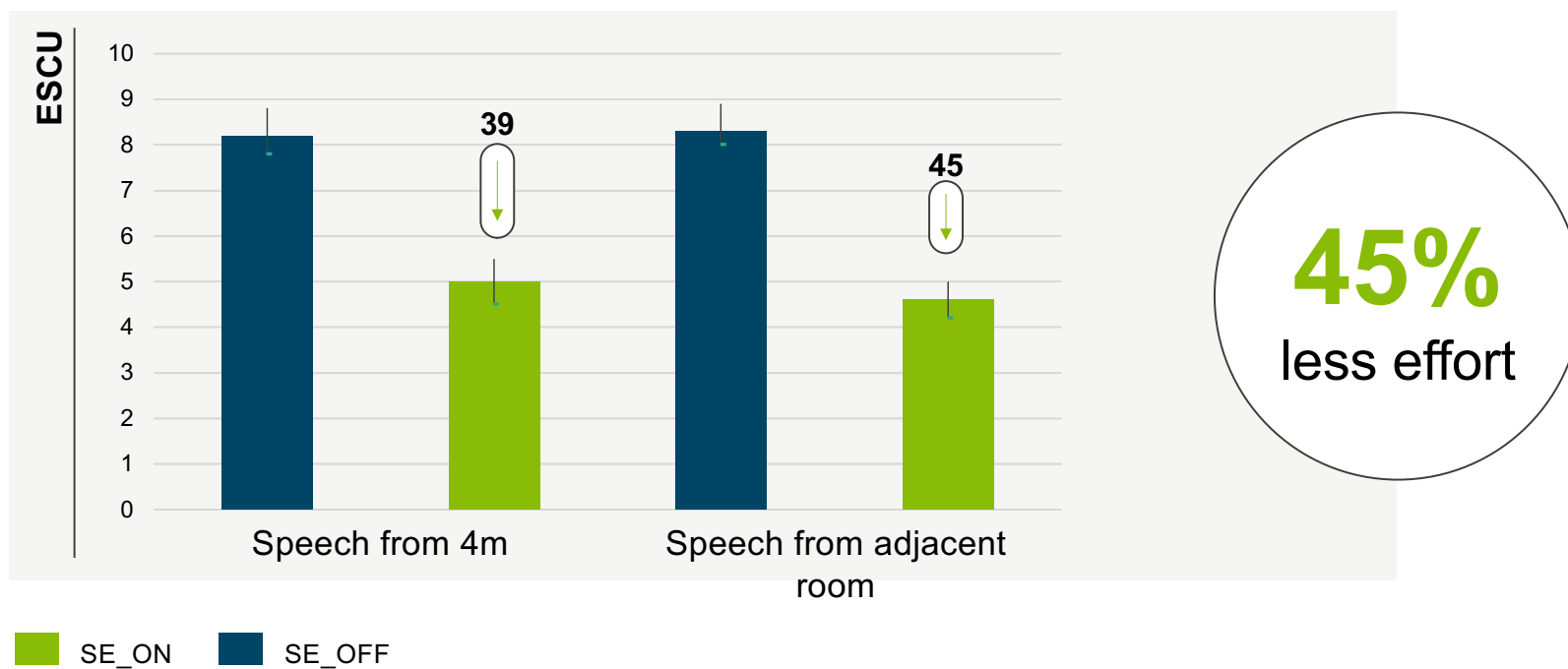


Speech from 4 meters



Speech from adjacent room

Reduced listening effort in both test conditions



ESCU : Effort Scaling units indicate the subjective behavioral data that reflects subjective personal experience of listening effort. The scale ranges from 1 (no effort) to 14 (noise only)

Exceptional sound quality from the first moment



93%

First fit
acceptance
compared to a
key competitor
device*

45%

Reduced
listening effort**

21%

Reduced
fatigue***

*Stewart, E., Adler, M., Seitz-Paquette, K., "Adaptive Phonak Digital (APD) 3.0 is the preferred first fit compared to a leading competitor device". Phonak Field Study News in preparation expected August 2024

**Latzel, M., Heeren, J and Lesimple, C. (2024) "Speech Enhancer reduces listening effort and fatigue." phonak Field Study News retrieved from www.phonak.com/evidence

***Habicht, J. & Schuepbach-Wolf, M. (2024). Speech Enhancer reduces subjective listening effort of speech by up to 45%. Phonak Field Study News retrieved from www.phonak.com/evidence

Infinio

Exceptional
sound quality
from the first
moment.



Connectivity
you can
count on.



**Tested.
Reliable.
Proven.** Swiss
engineering at
its best.



Personalized
for you and
your patients.



Clear speech
from any
direction **with**
**Spheric
Speech
Clarity.**





**Introducing
Spheric Speech
Clarity** – for clean
and clear speech
far beyond any
existing hearing
technology



Innovating in the AI field for 24 years

1947

Zurich

Foundation of the

“AG für Elektroakustik”



2000

Phonak started research in the field and used machine learning to train the classifier



2007

CORE
SoundFlow



2014

Venture
AutoSense
OS



2018

Phonak Marvel
Universal
connectivity with
AI trained
streaming
classification

19

Studies

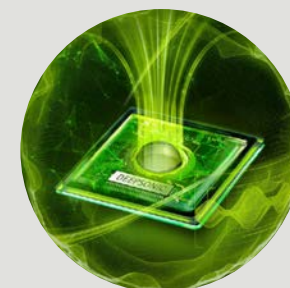
150

Hearing impaired
subjects



2019

Phonak started
to research
DNN signal
processing
models



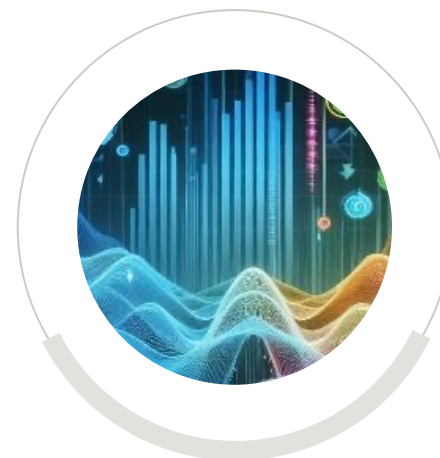
2024



Technical



**Clinical
objective**

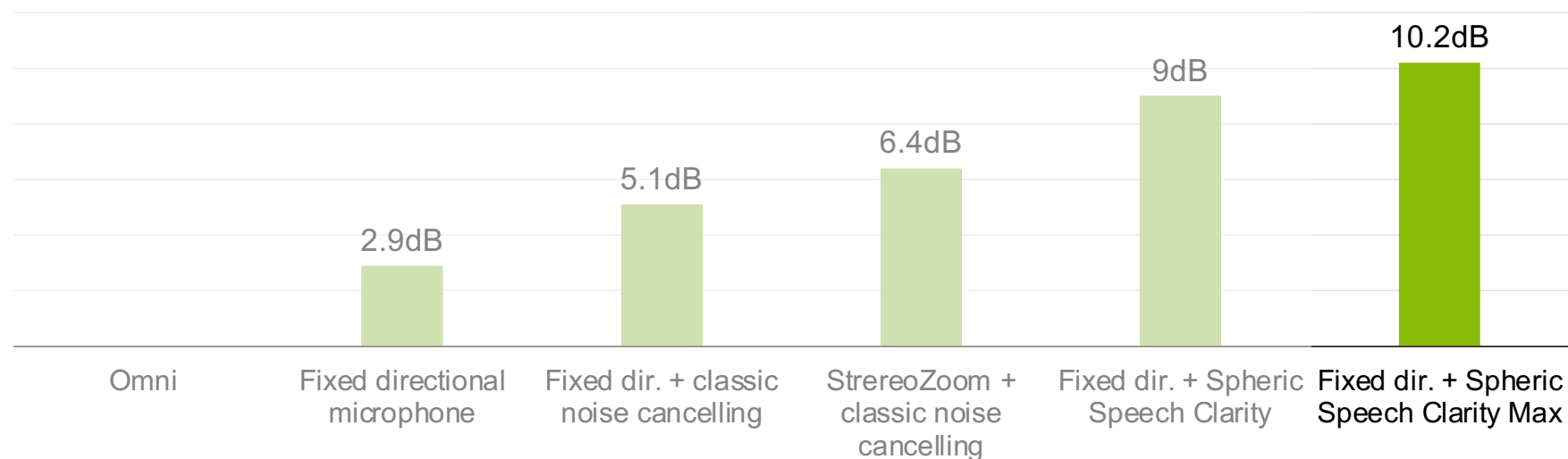


Clinical subjective



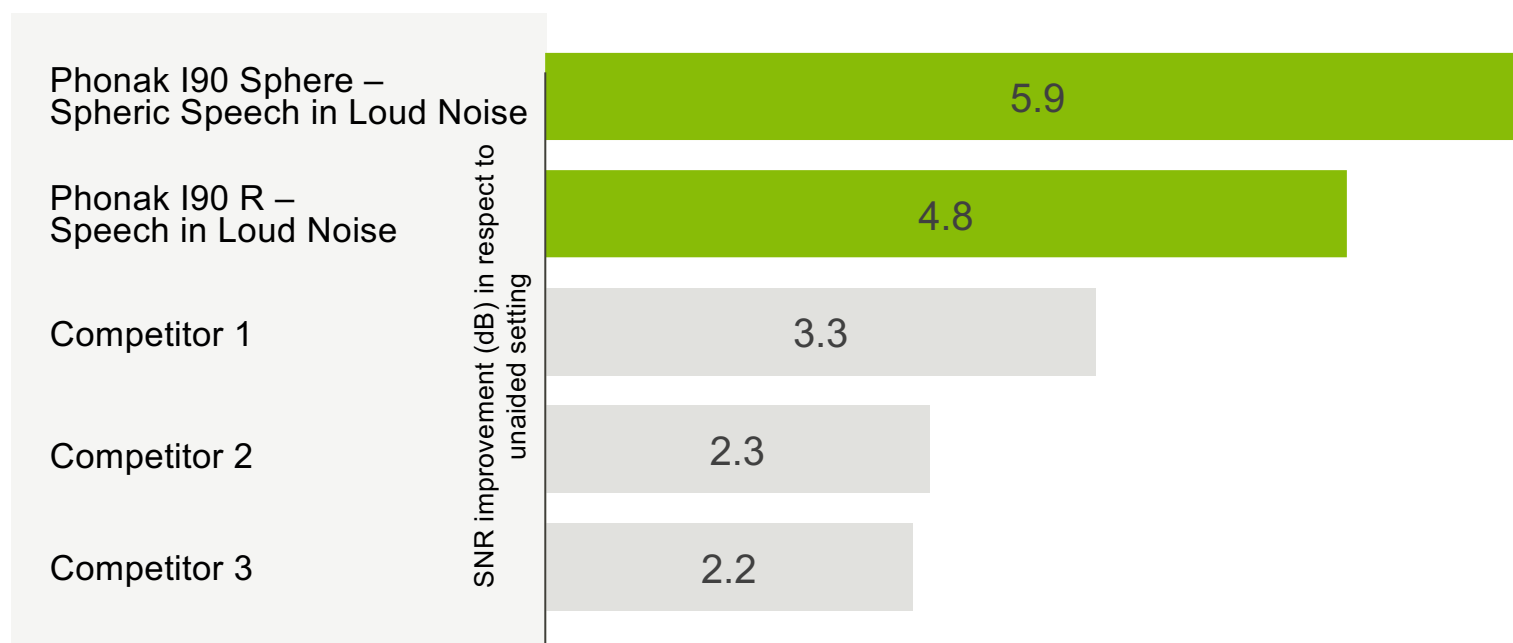
Progression of technology delivering SNR benefit

SNR improvement (dB) in respect to Omni setting



Raufer, S., Kohlauer, P., Jehle, F., Kühnel, V., Preuss, M., Hobi, S. (2024). Spheric Speech Clarity proven to outperform three key competitors for clear speech in noise. Phonak Field Study News. <https://www.phonak.com/evidence>

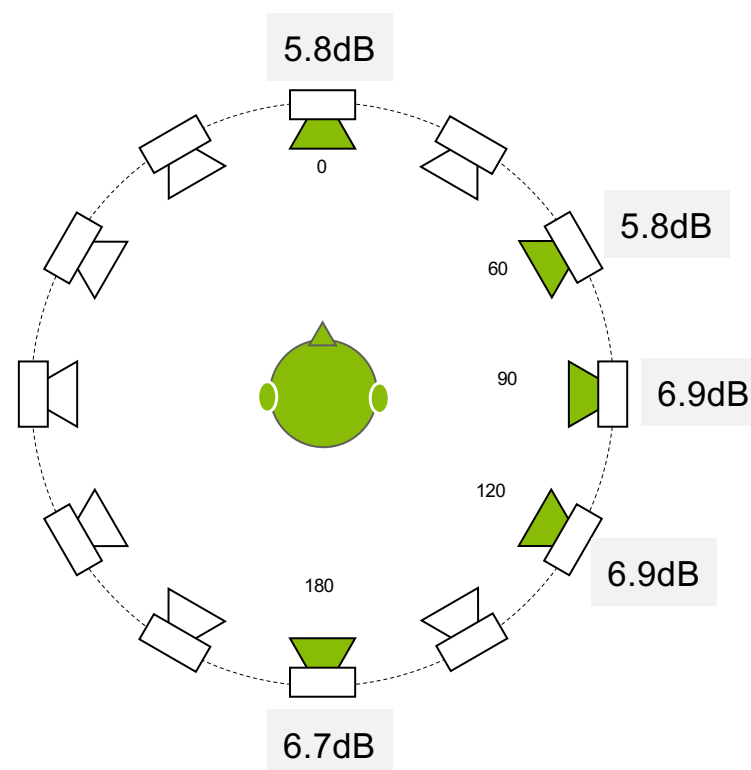
Industry leader in delivering clear speech



Competitor comparison: SII-weighted signal to noise ratio (SNR) improvements in dB with respect to unaided averaged across three realistic scenes. Results are presented for a fully occluded coupling and for the better ear. The speech signal was always presented from 0° azimuth. Phonak I90 Spheric Speech in Loud Noise program at default strength and Phonak I90 R Speech in Loud Noise program are compared to three leading competitors. Rauber, S., Kohlhauser, P., Jehle, F., Kühnel, V., Preuss, M., Hobi, S. (2024). Spheric Speech Clarity proven to outperform three key competitors for clear speech in noise. Phonak Field Study News, <https://www.phonak.com/evidence>

Clear speech not just from in front

Spheric Speech Clarity is able to separate the speech from the noise to maintain, independent of direction, SNR benefit



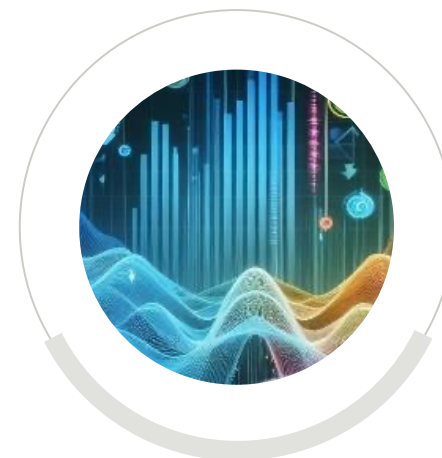
Raufer, S., Kohlauer, P., Jehle, F., Kühnel, V., Preuss, M., Hobi, S. (2024). Spheric Speech Clarity proven to outperform three key competitors for clear speech in noise. Phonak Field Study News. <https://www.phonak.com/evidence>



Technical

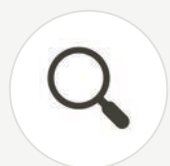


**Clinical
objective**



Clinical subjective

Spheric Speech Clarity: What is the perceptual benefit?



Study objectives

Primary:

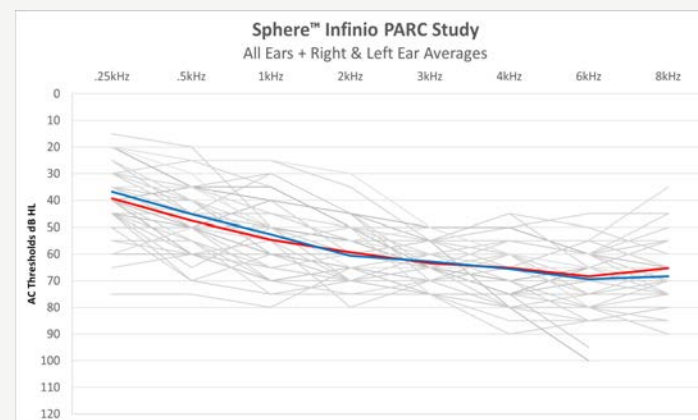
Improved speech understanding feature on versus off, from any direction.

Secondary

- Improved speech understanding **compared to 2 key competitors**, from any direction
- Listening effort feature on versus off
- “Real world” subjective rating compared to competitors

Study details

- 27 Subjects
- 15 male, 12 female
- Experienced users

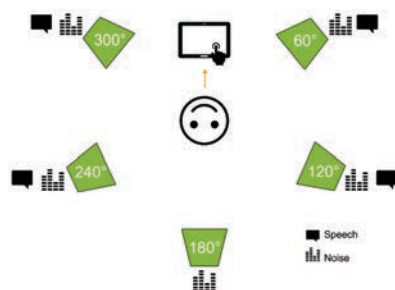


Study conditions to measure speech benefit and listening effort

Speech understanding benefit from 4 locations via a modified Coordinate Response Measure (CRM) task

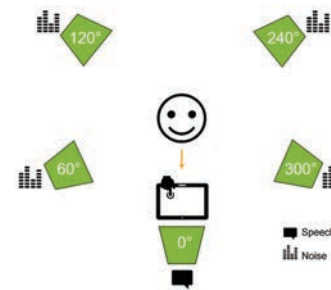
1 Real Ear Sound with Spheric Speech Clarity vs. Real Ear Sound without Spheric Speech Clarity

2 Spheric Speech in Loud Noise sound class vs. The speech and noise sound classes of 2 key competitors

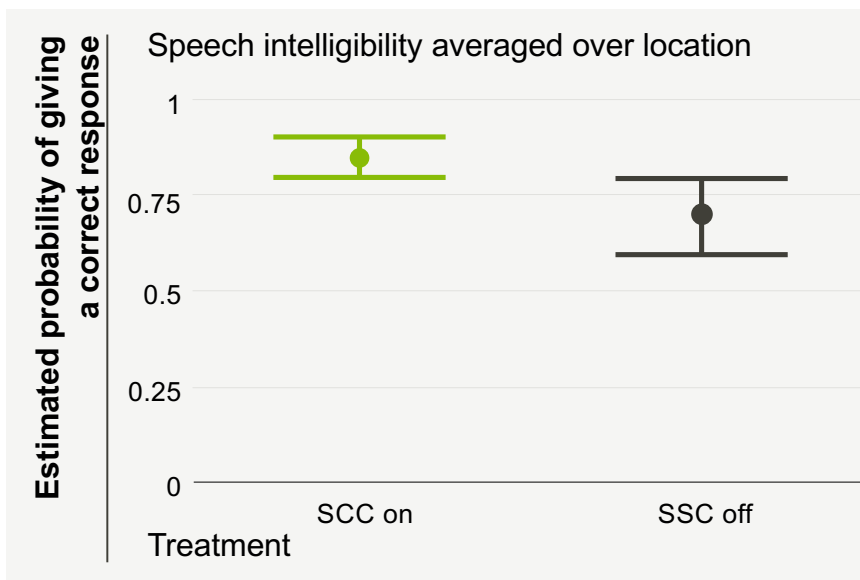


Listening effort via Adaptive Catrgorical Listening Effort Scaling (ACALES)

3 Real Ear Sound with Spheric Speech Clarity vs. Real Ear Sound without Spheric Speech Clarity



Every word matters ...

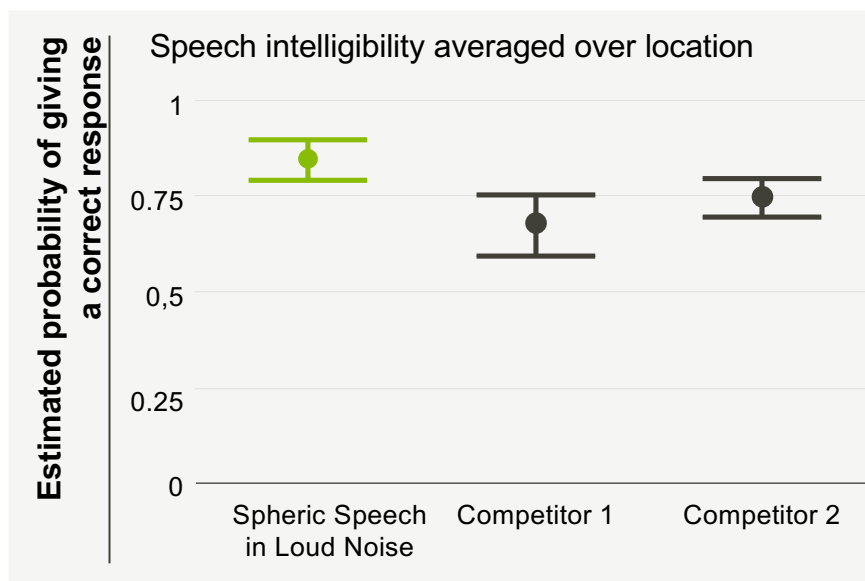


The chances of giving a correct response (odds) were calculated and then compared between conditions (odds ratio). This tells us how much more likely it was to give a correct response using SSC.

2x

more likely to
understand
speech with
Spheric Speech
Clarity on

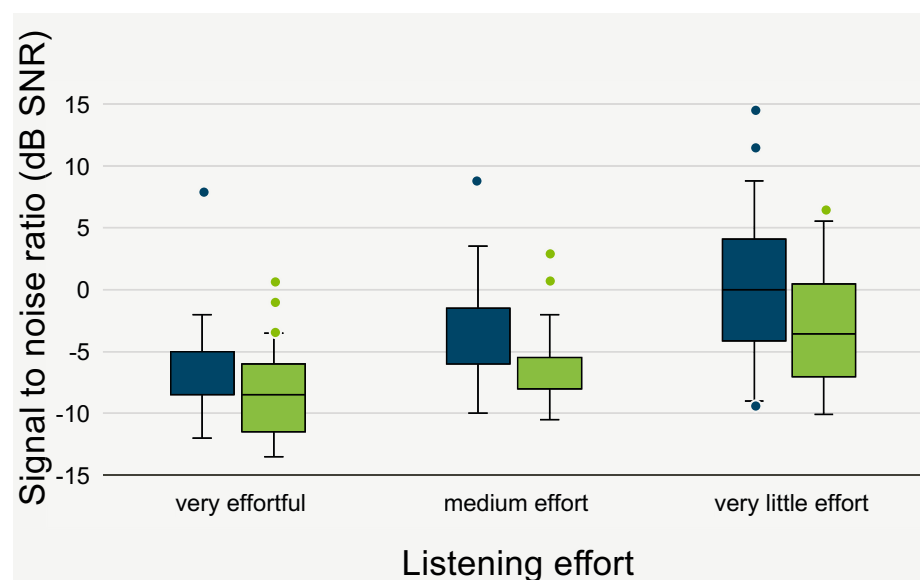
More likely to hear every word compared to two key competitors



Up to **3x**
more likely to
understand
speech compared
to two key
competitors

Up to
36.7%
more answers
correct

Spheric Speech Clarity reduces listening effort



Participants
could tolerate
**2.9 dB poorer
SNR** without an
increase in
listening effort

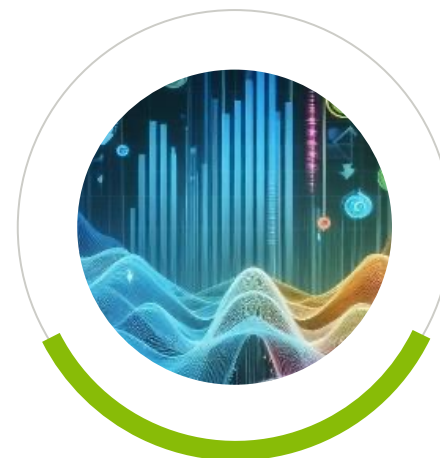
■ Spheric Speech Clarity off ■ Spheric Speech Clarity on



Technical



**Clinical
objective**

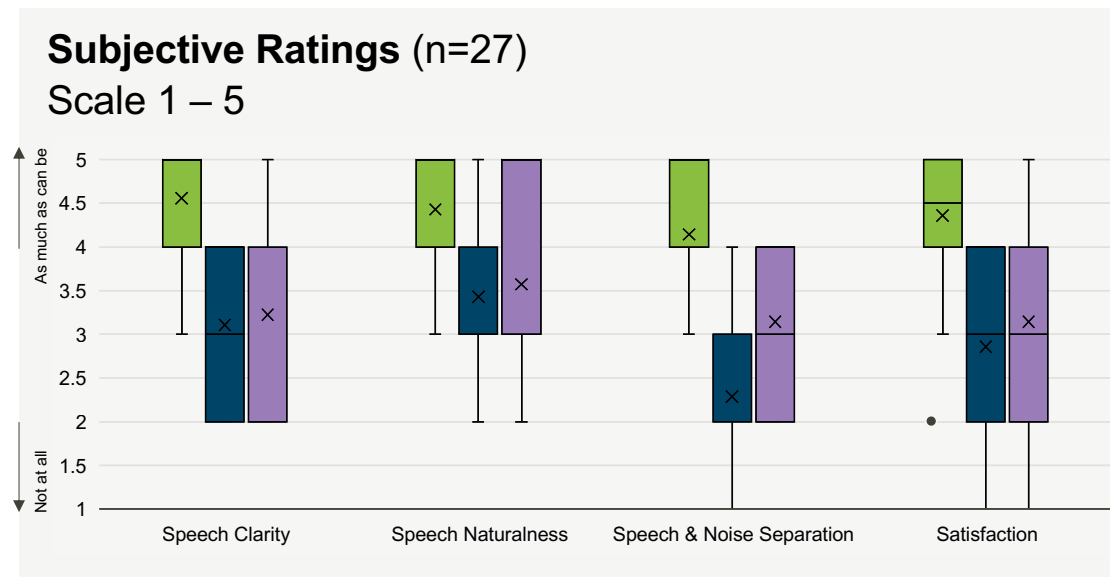
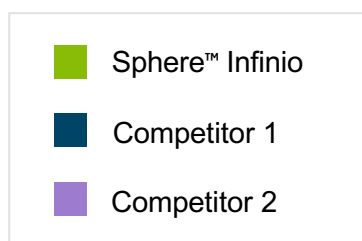


Clinical subjective

Sphere™ Infinio rated best over four categories in subjective lab tests

Rated for **Sphere™ Infinio** and **two competitors**:

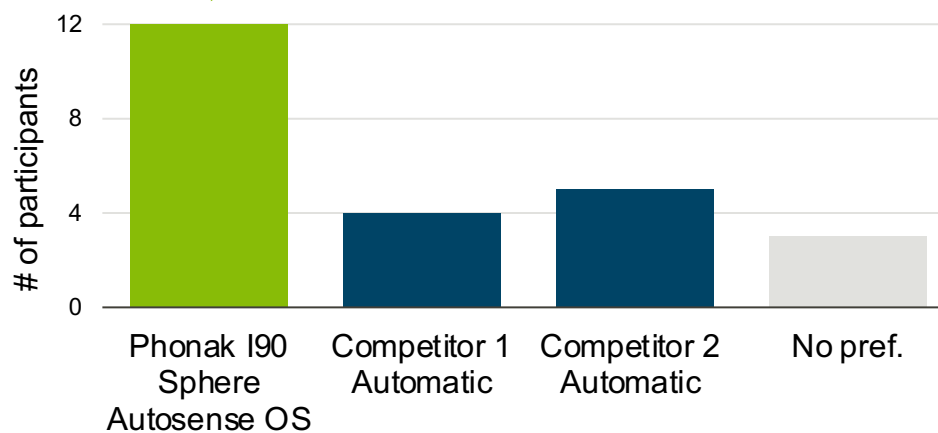
- Speech clarity
- Speech naturalness
- Speech and noise separation
- Overall satisfaction





Out of the lab and into the world

More participants
preferred Sphere™ Infinio
than two competitors combined



Cafe visit overall preference, n=24

Wright, A., et al (2024) Phonak Audéo Sphere Infinio is preferred by patients during real world use. Field Study News
<https://www.phonak.com/evidence>

Being in the
moment was
never this easy



10dB
SNR

SNR benefit*; up
to 3.7dB more
than key
competitors

2X
more likely ...

... to hear and
understand every
word in any
direction**

Up to
36.7%

Increase in speech
understanding
compared to two key
competitor devices**

*compared to omni; Raufer, S., Kohlauer, P., Jehle, F., Kühnel, V., Preuss, M., Hobi, S. (2024). Spheric Speech Clarity proven to outperform three key competitors for clear speech in noise. Phonak Field Study News. <https://www.phonak.com/evidence>

**Wright, A., et al "Spheric Speech Clarity applies DNN signal processing to significantly improve speech understanding from any direction and reduce the listening effort ." Phonak Field Study News. <https://www.phonak.com/evidence>

Infinio

Exceptional
sound quality
from the first
moment.



Connectivity
you can
count on.



**Tested.
Reliable.
Proven.** Swiss
engineering at
its best.



Personalized
for you and
your patients.



Clear speech
from any
direction **with**
**Spheric
Speech
Clarity.**





Together,
we change lives ●

Scientific publications



Insight

Artificial Intelligence
in hearing aid
technology

Revolutionary
speech clarity with
Spheric Speech
Clarity

Field Study News

Adaptive Phonak Digital (APD) 3.0 is the preferred first fit compared to a key competitor device

Speech Enhancer reduces listening effort and fatigue

Speech Enhancer reduces subjective listening effort of speech by up to 45%

Spheric Speech Clarity proven to outperform competitors for clear speech in noise

Spheric Speech Clarity applies DNN signal processing to significantly improve speech understanding from any direction and reduce the listening effort

Phonak Audéo Sphere Infinio is preferred by patients during real world use

Available at Phonak.com/evidence