
HLAA
Hearing Loss Association of America
Westchester Chapter


Hudson Valley
AUDIOLOGY CENTER

AGENDA

01 Introduction

02 The Ear to Brain Connection

03 Hearing Loss & Cognition

04 Auditory Training

05 New Treatments for Tinnitus

06 Auracast

07 Q&A

Background

- Bachelor of Electrical Engineering from University of Dayton
- Doctor of Audiology (Au.D.) from University of Louisville
- Research Audiologist at the National Center for Auditory Research (NCRAR) at the Portland VA Medical Center
- Joined Hudson Valley Audiology in 2010, Owner in 2014
- Professional member of:
  - American Tinnitus Association (ATA)
  - American Academy of Audiology (AAA)
  - Academy of Doctors of Audiology (ADA)
  - NYS Speech Language Hearing Association (NYSSLHA)

VA Rehabilitative National Centers of Excellence

Limb Loss & Prosthetics
(Seattle, WA)

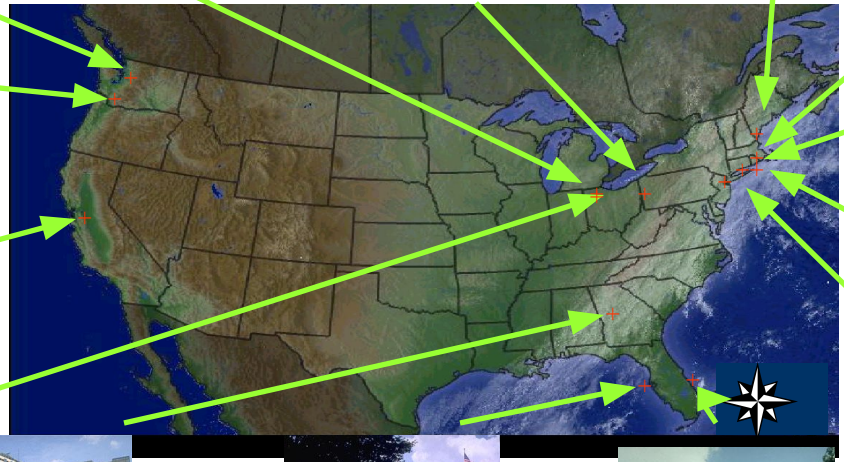
Functional Electrical Stimulation
(Cleveland, OH)

Wheelchair Technology
(Pittsburgh, PA)

Innovative Visual Rehabilitation
(Boston, MA)

Restorative & Regenerative Medicine
(Providence, RI)

Auditory Rehabilitation
(Portland, OR)



Spinal Cord Injury & MS
(West Haven, CT)

Bone & Joint Rehabilitation
(Palo Alto, CA)

Spinal Cord Injury
(Bronx, NY)

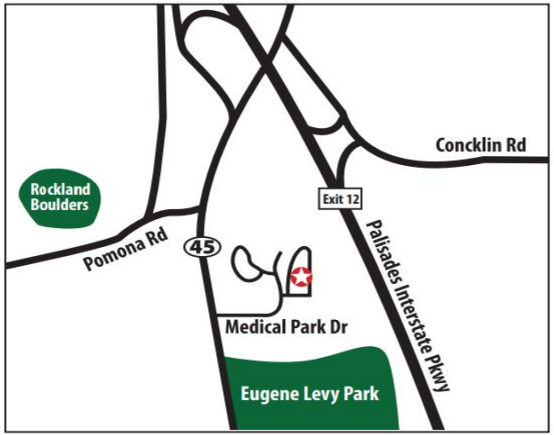
Platform Technology
(Cleveland, OH)

Aging & Vision Loss
(Decatur, GA)

Brain Rehabilitation
(Gainesville, FL)

Spinal Cord Injury
(Miami, FL)

Exercise & Robotics
(Baltimore, MD)



11 Medical Park Dr, Ste 205 • Pomona, NY 10970
845.362.1350 | HudsonAudiology.com

Hudson Valley AUDIOLOGY CENTER

Your *Experts* in Hearing Care

Jeffrey Shannon, *Au.D., Audiologist* • **Christopher Herget,** *Au.D., Audiologist*
Amanda Rodriguez, *Au.D., Audiologist* • **Millicent Peterson,** *Au.D., Audiologist*
Levi Young, *Au.D., CCC-A, Audiologist* • **Kathleen Barna,** *Back-Office Coordinator*
Karen Romano, *Patient Care Coordinator* • **Elaine Meade,** *Back-Office Coordinator*
Allison Sullivan, *Patient Care Coordinator*

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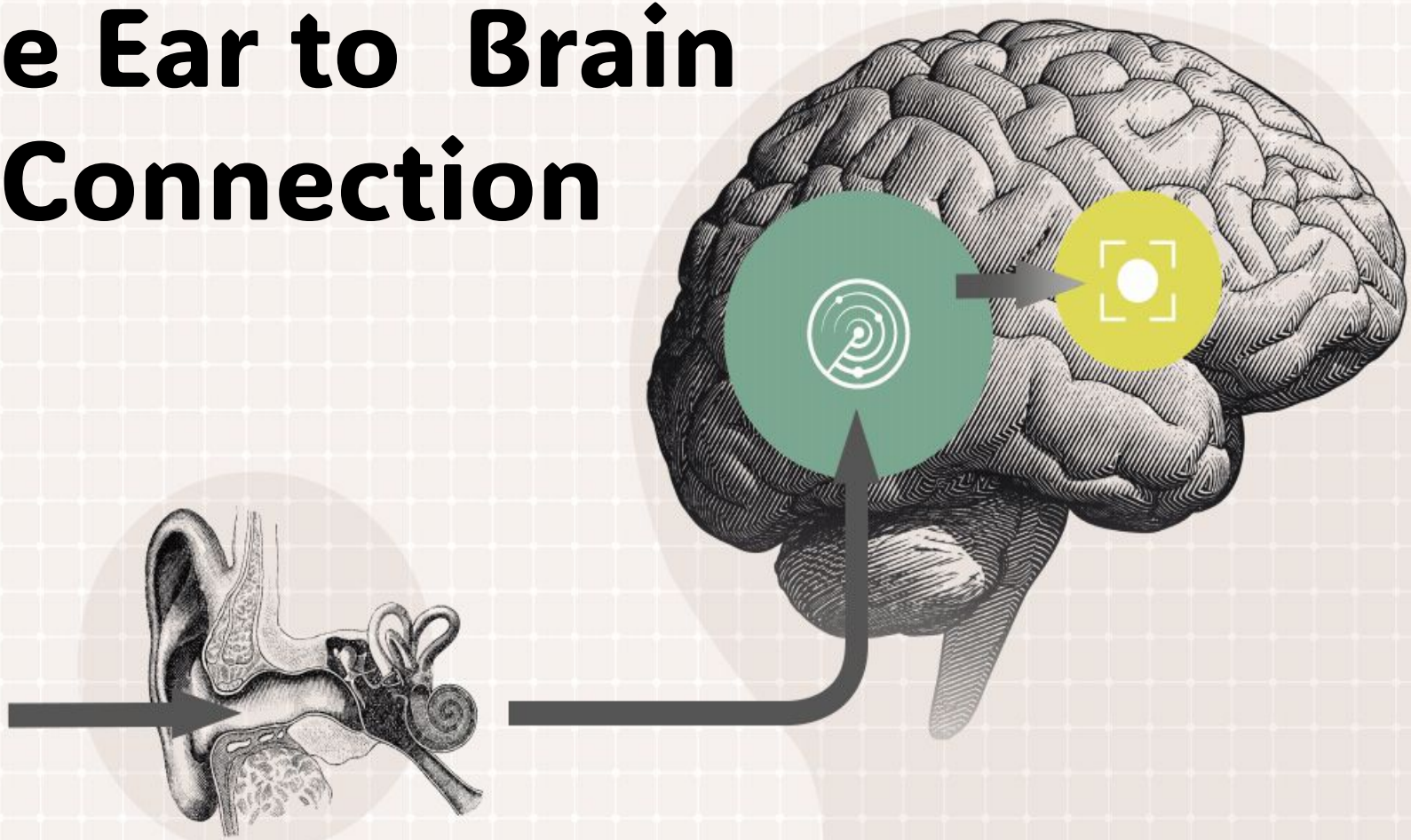
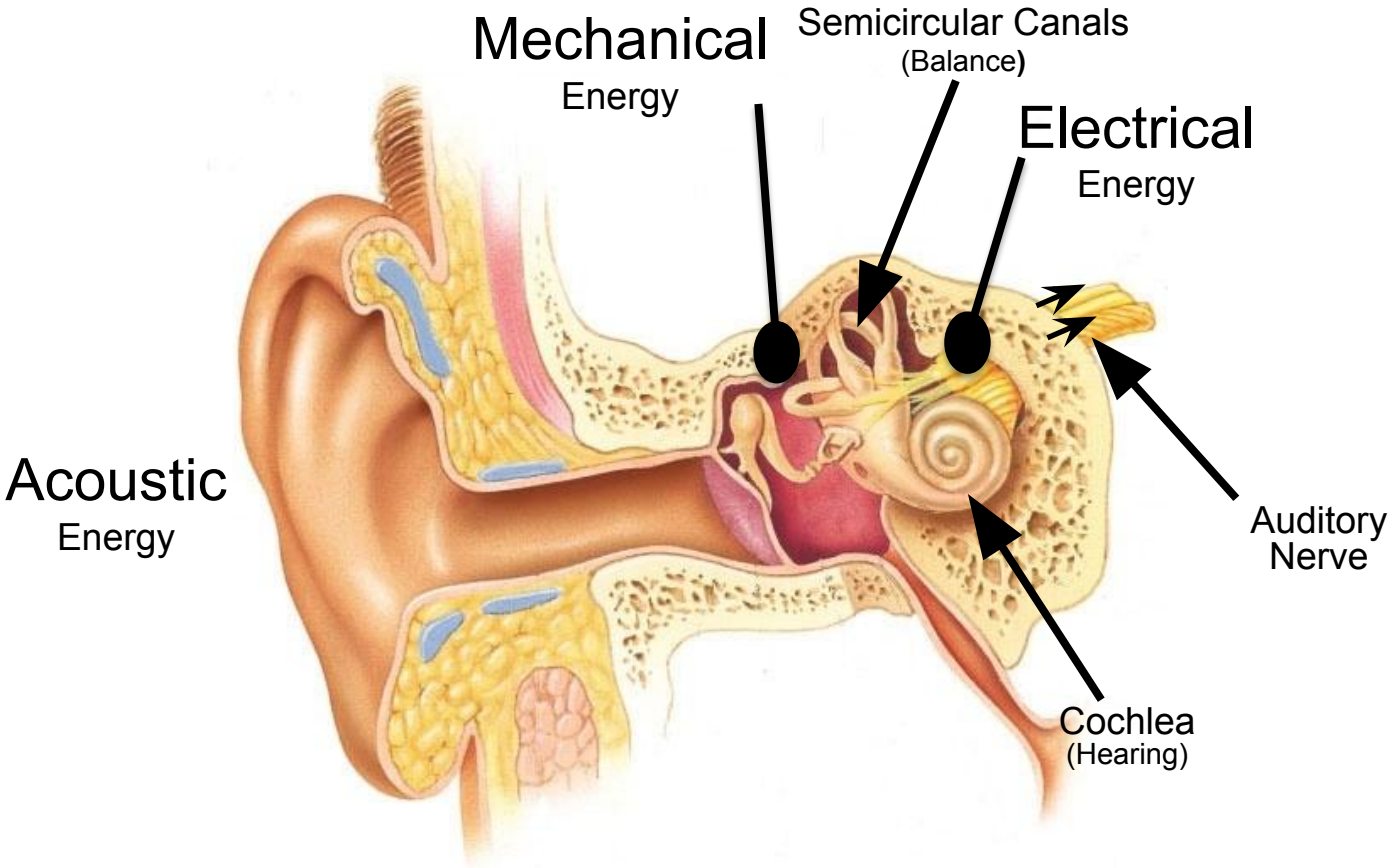
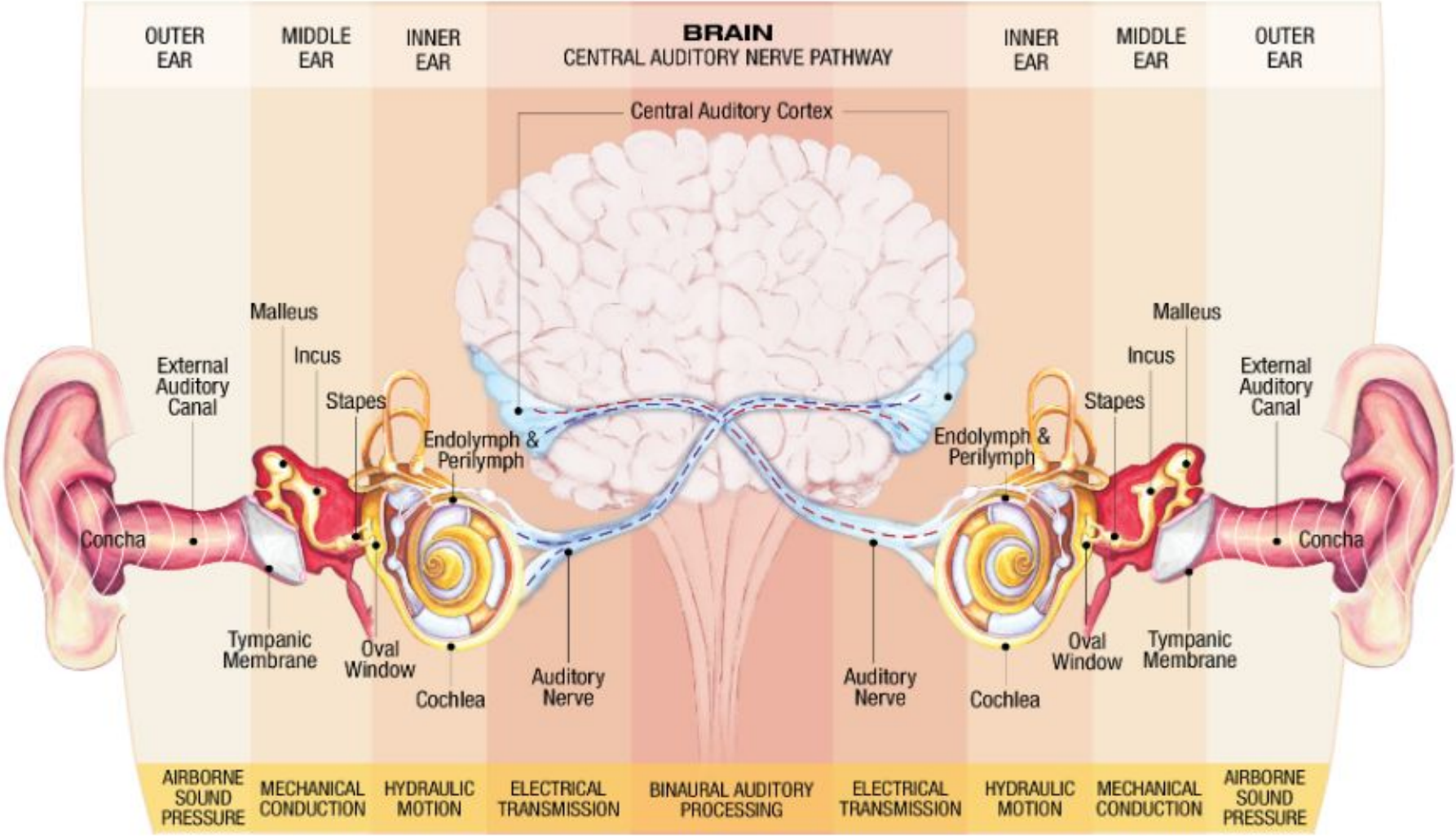
Pomona, NY • 11 Medical Park Dr. Ste 205
Goshen, NY • 5 Coates Dr

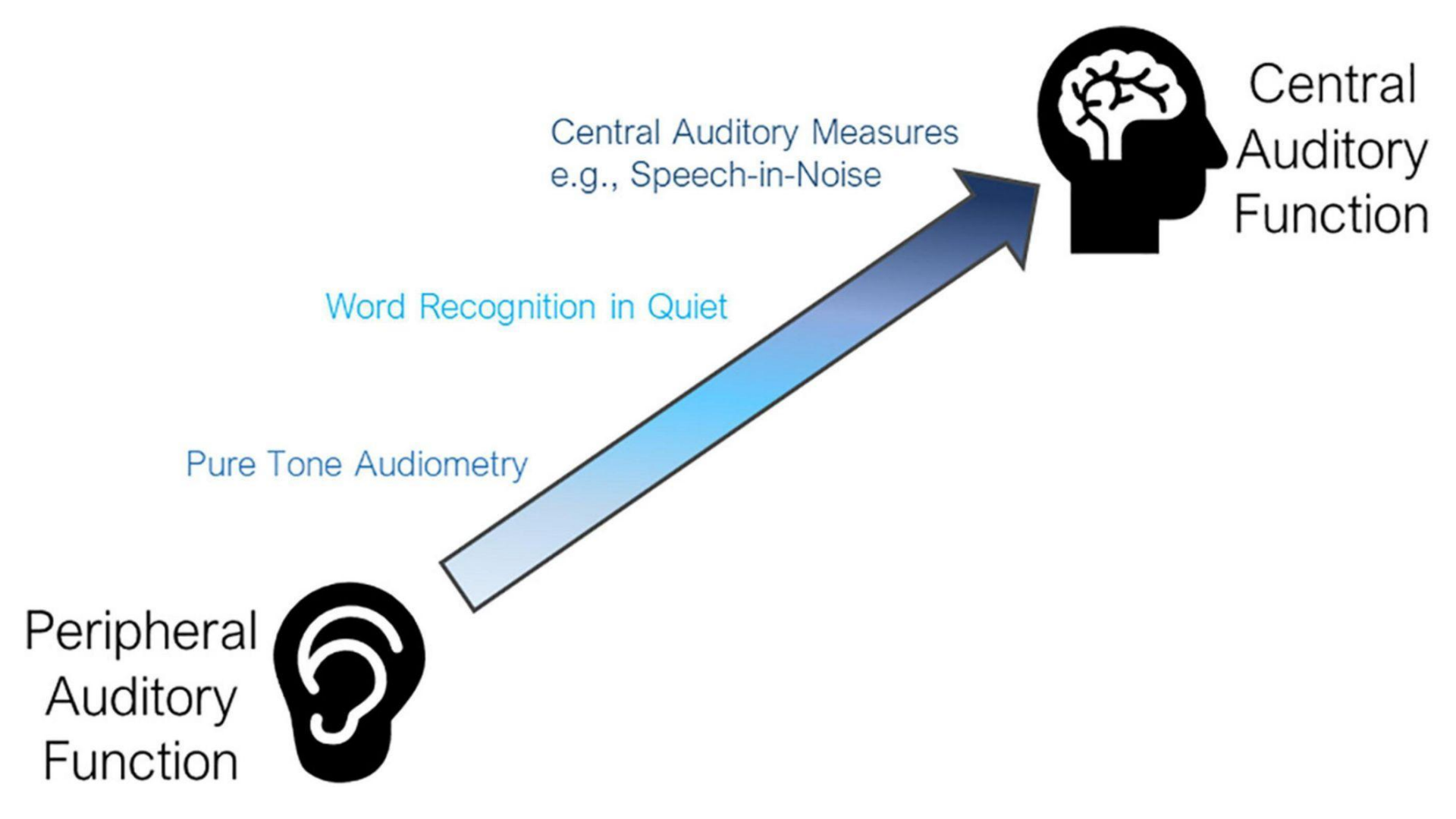
The Ear to Brain Connection



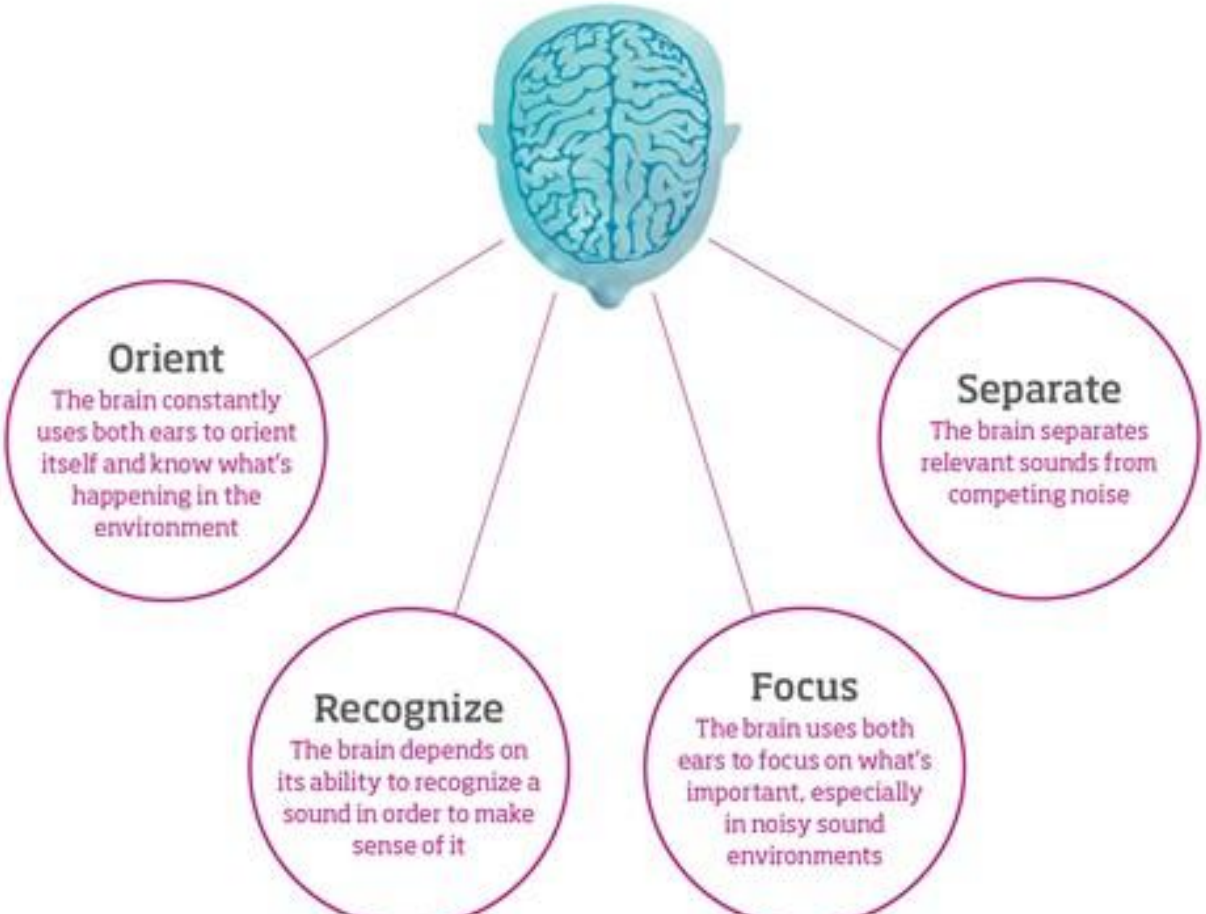
Inner Ear Anatomy & Function



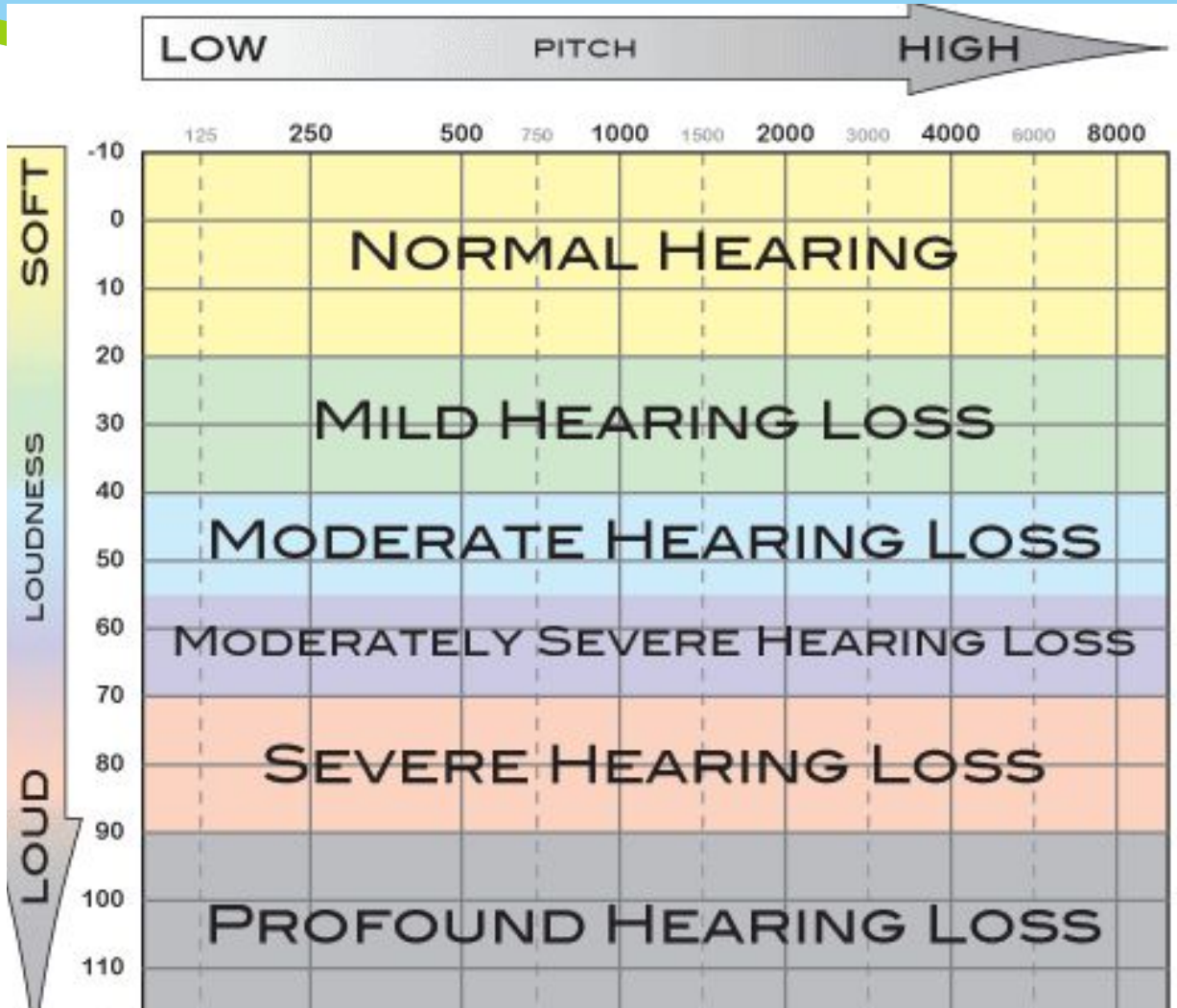

OUTER EAR
MIDDLE EAR
INNER EAR
BRAIN
CENTRAL AUDITORY NERVE PATHWAY
INNER EAR
MIDDLE EAR
OUTER EAR
Central Auditory Cortex
Malleus
Incus
Stapes
External Auditory Canal
Endolymph & Perilymph
Concha
Tympanic Membrane
Oval Window
Cochlea
Auditory Nerve
Auditory Nerve
Cochlea
Oval Window
Tympanic Membrane
Malleus
Incus
Stapes
Endolymph & Perilymph
External Auditory Canal
Concha
AIRBORNE SOUND PRESSURE
MECHANICAL CONDUCTION
HYDRAULIC MOTION
ELECTRICAL TRANSMISSION
BINAURAL AUDITORY PROCESSING
ELECTRICAL TRANSMISSION
HYDRAULIC MOTION
MECHANICAL CONDUCTION
AIRBORNE SOUND PRESSURE


Central Auditory Measures
e.g., Speech-in-Noise
Central
Auditory
Function
Word Recognition in Quiet
Pure Tone Audiometry
Peripheral
Auditory
Function

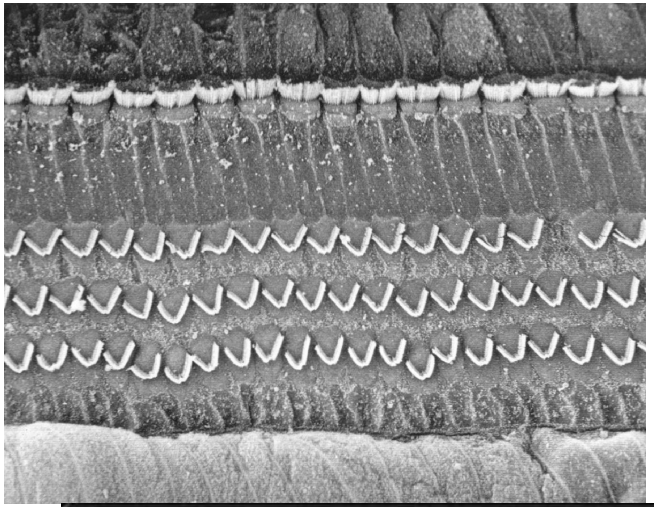
Brain Hearing

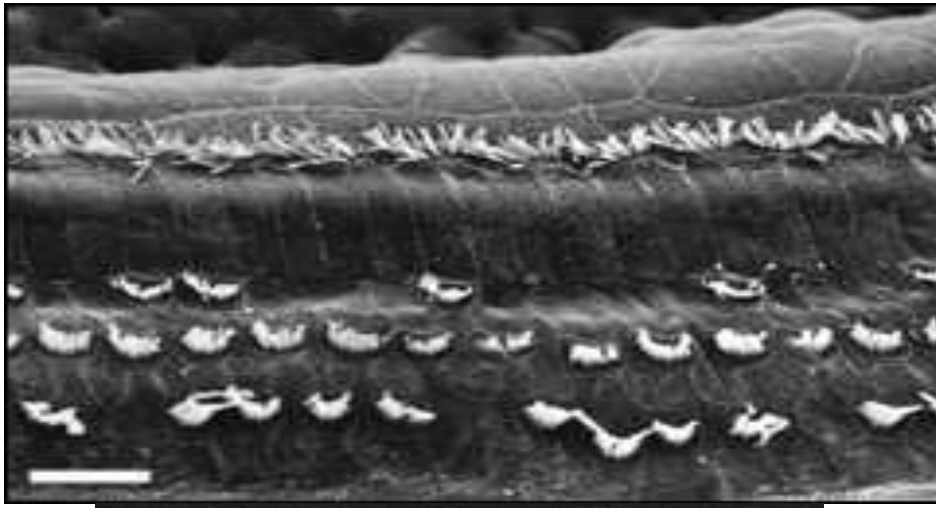


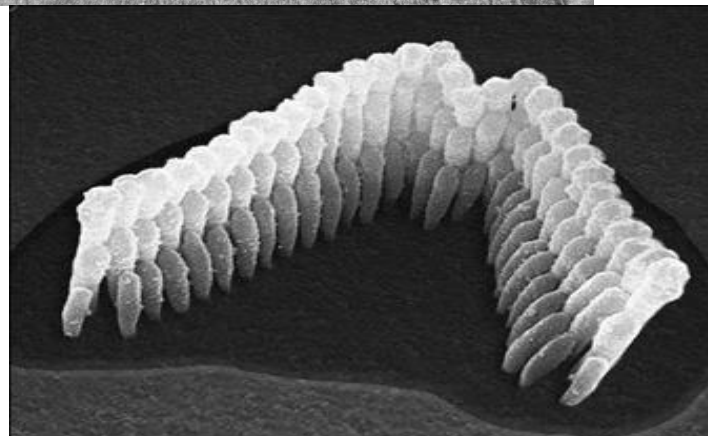

Signs of hearing loss
1 Misunderstanding people
2 Turning the TV or radio up
3 Cannot hear high pitched sounds
4 Asking people to repeat themselves
5 Problems in noisy environements
6 Speaking loudly
7 Ringing in the ear or head
8 Difficulties on the telephone

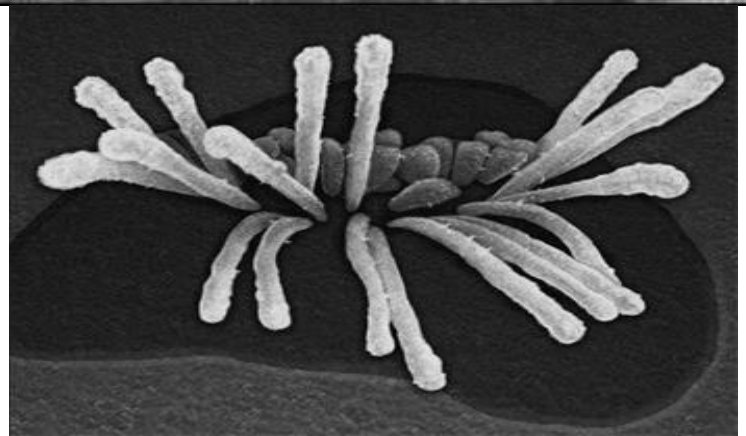


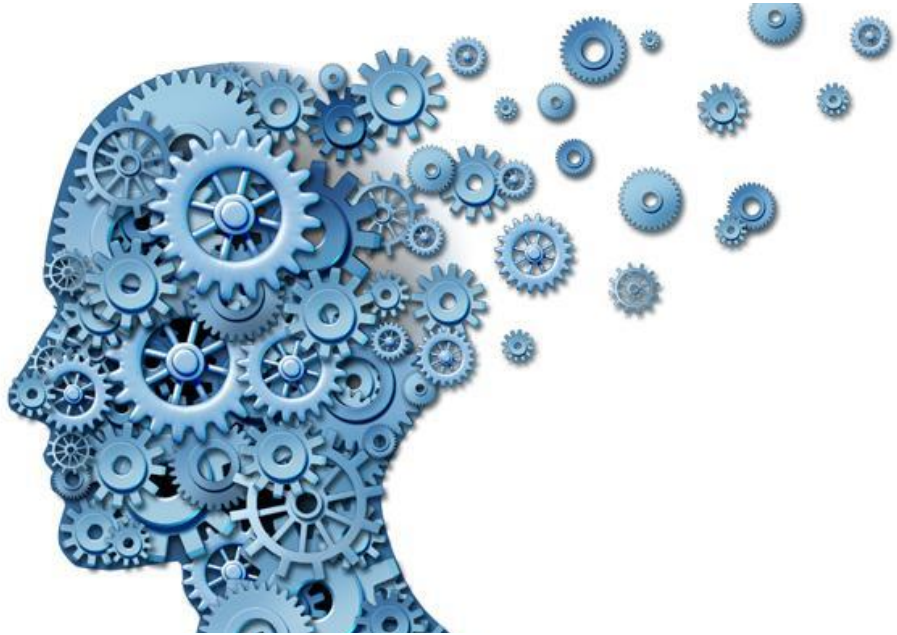
Hair Cell Damage in Cochlea











Hearing Loss & Cognition

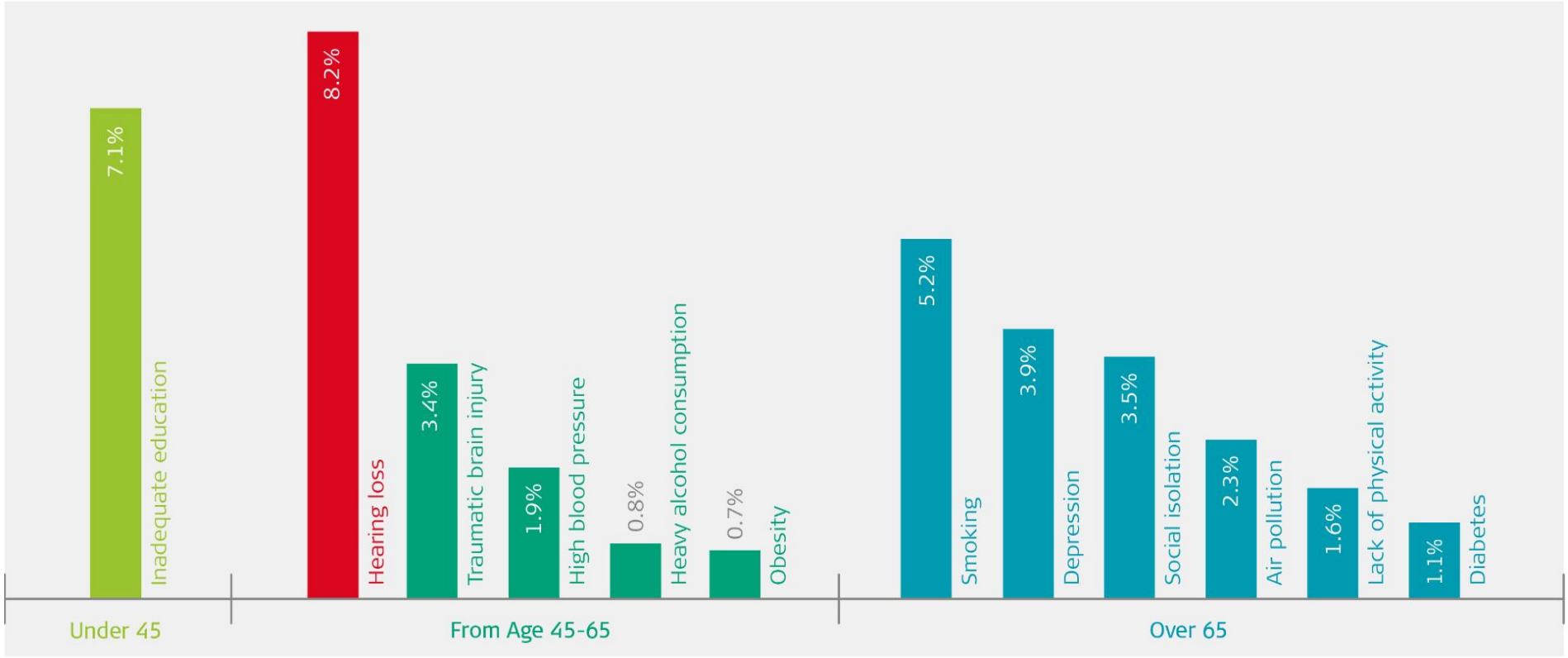
Hearing Loss and Cognitive Decline

- The intersection of hearing loss and cognitive decline represents a growing area of public health concern

- Hearing loss is strongly linked to cognitive decline, including conditions like
  - **Dementia**
  - **Alzheimer's disease**

- As life expectancy continues to rise, a greater number of individuals are experiencing age-related sensory impairments alongside a decline in cognitive functions.

Modifiable Risk Factors for Dementia

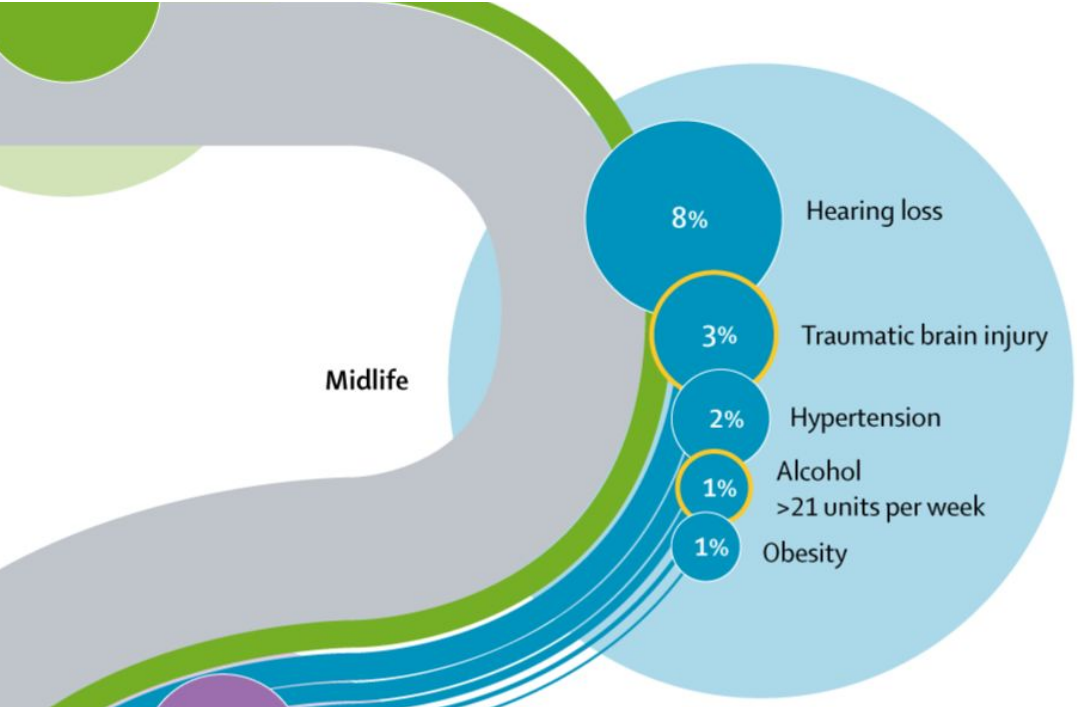


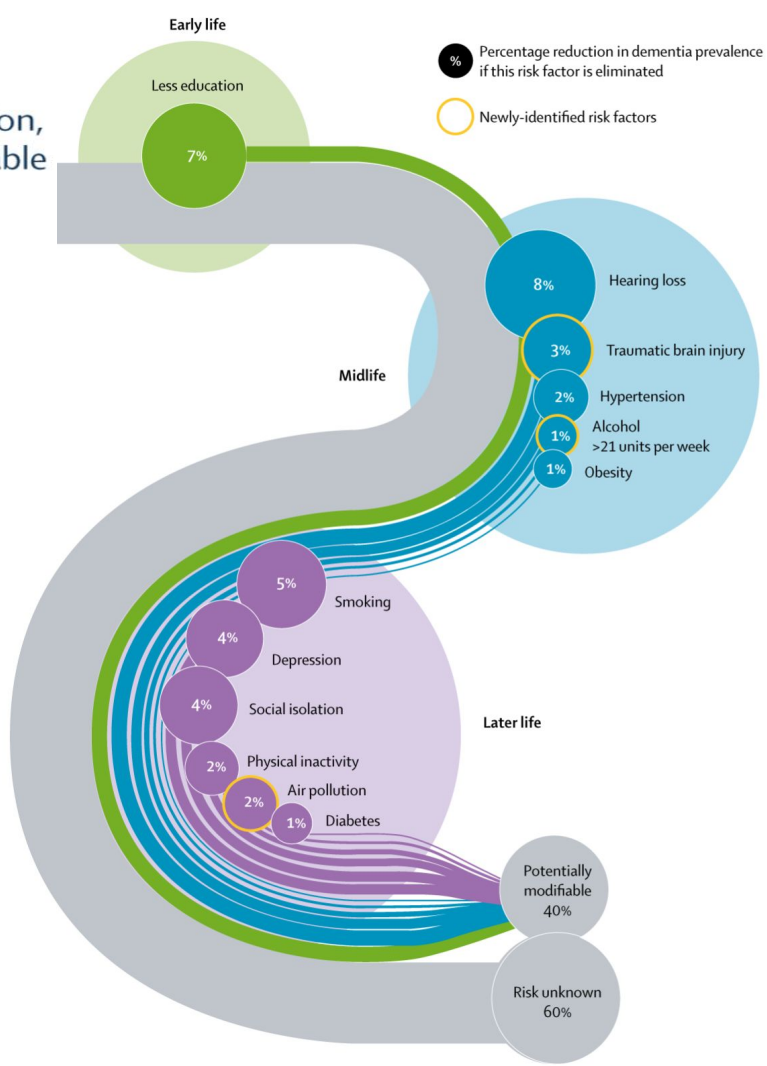
Percentages (as weighted population attributable fractions) indicate decreased dementia prevalence if each potentially modifiable risk factor is eliminated, with 60.3% of risk unknown.

Source: Data from Livingston, G., Huntley, J., Sommerlad, A., Ames, D., Ballard, C., Banerjee, S., Brayne C., (...), & Mukadam, N. (2020) Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. The Lancet. 396(10248), 413-446. doi:10.1016/S0140-6736(20)30367-6

Risk factors for dementia

An update to the *Lancet* Commission on Dementia prevention, intervention, and care presents a life-course model showing that 12 potentially modifiable risk factors account for around 40% of worldwide dementias





Severity Matters

Dementia & Hearing Loss

Mild hearing loss: **2 times**
more likely to develop dementia

Moderate hearing loss: **3 times**
more likely to develop dementia

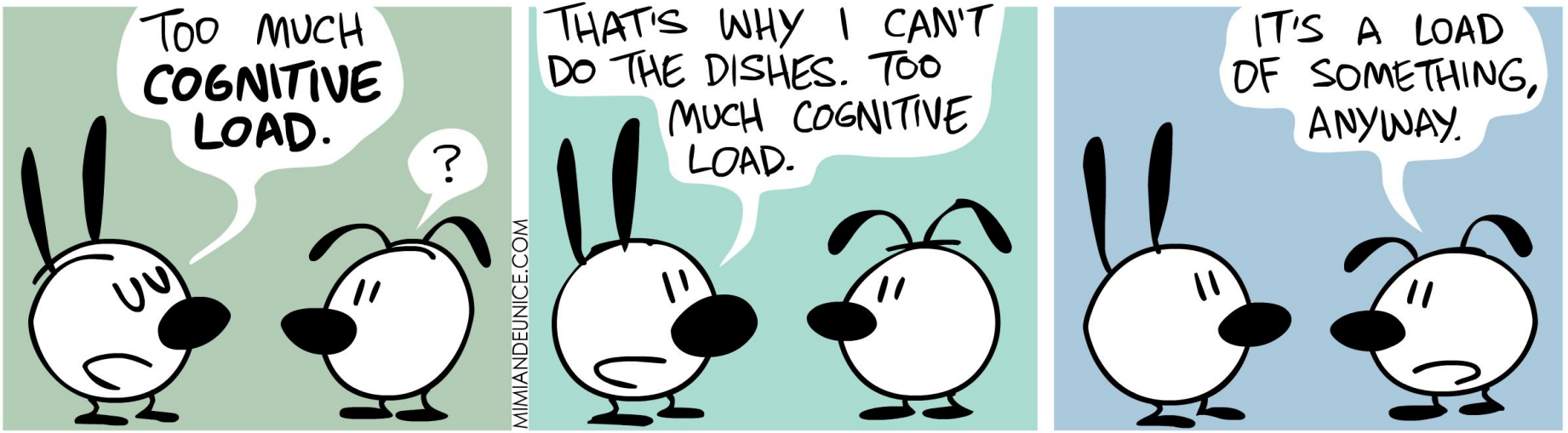
Severe hearing loss: **5 times**
more likely to develop dementia

What's Happening in the Brain?

1. Increased cognitive load (effortful listening)
2. Brain structural changes
3. Sensory deprivation

Untreated Sensorineural Hearing Loss Affects…

The Ear (and Auditory System)
AND
Brain Structures




PERFECT
HEARING
LOOKS
LIKE
THIS.


IMPAIRED
HEARING
LOOKS
LIKE
THIS.

The Brain's Struggle (Effortful Listening)

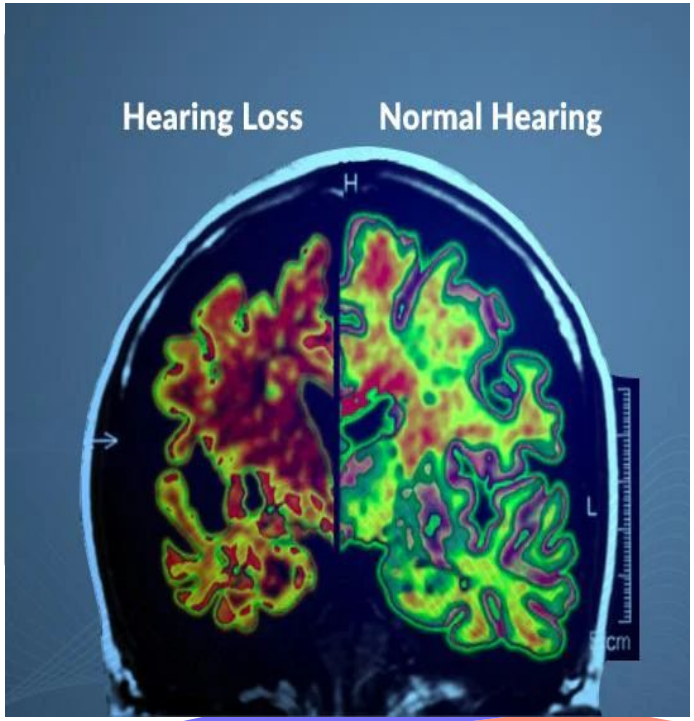
- When the brain struggles to process sounds due to hearing loss, it compensates by working harder
- This increased effort drains cognitive resources, leading to changes in the brain, such as atrophy
- Over time, this can contribute to a decline in cognitive function

Brain Structural Changes - “Use it or Lose it”

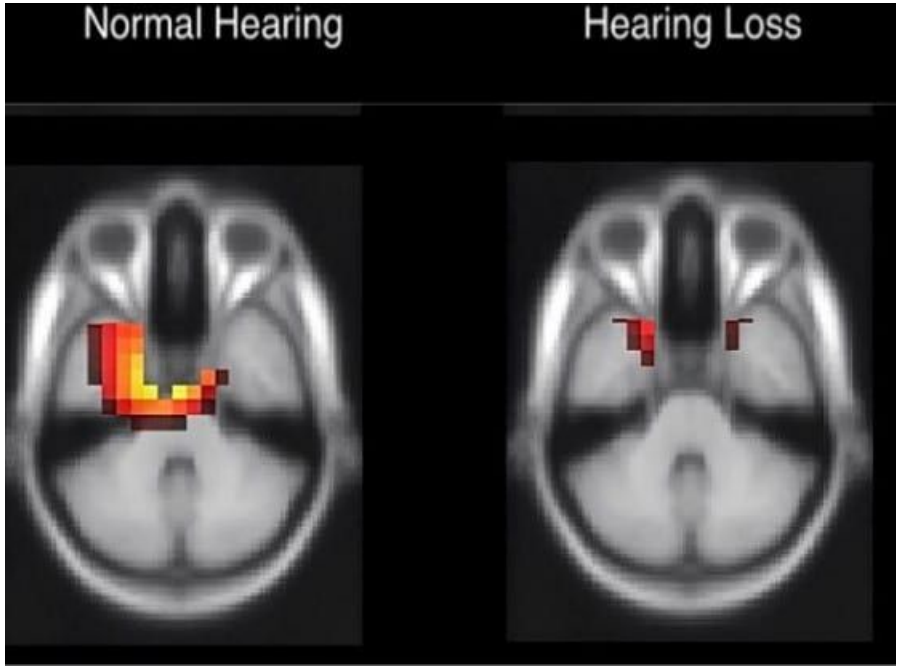
Lack of Sufficient Input Causes Brain Atrophy

Research has linked hearing loss to an accelerated rate of **brain tissue loss and a reduction in gray matter volume**, particularly in the temporal lobe, which plays a crucial role not only in processing sound but also in memory functions.

Furthermore, hearing loss might also lead to **changes in other brain regions**, such as the frontal lobe, involved in attention and executive functions, and the hippocampus, critical for memory.



Sensory Deprivation



Adults with early-stage age-related hearing loss (right) show decreased activation of the hearing portion of the brain compared with normal hearing age-matched adults (left).

The Lack of Adequate Auditory Stimulation Can Lead To:

- **Nerve Fibers** losing their connections
- **Cortical Reorganization** , where the brain repurposes areas that are not receiving their usual sensory input.

Mechanism	Brief Description	Supporting Evidence
Increased Cognitive Load (Effortful Listening)	Brain requires **more resources to process degraded auditory input**, leaving fewer resources for other cognitive functions.	Increased activity in prefrontal cortex during listening tasks in hearing-impaired individuals [3]; Reduced resources for memory and executive function.[3]
Brain Structural Changes	**Reduced auditory stimulation leads to atrophy** in auditory processing regions (temporal lobe, auditory cortex).	Faster rate of brain tissue loss and reduced gray matter volume in temporal lobe of individuals with hearing loss.[3]
Sensory Deprivation	**Prolonged lack of auditory input causes loss of nerve fiber connections, cortical reorganization**, and atrophy, potentially exacerbating brain pathology.	Reduced gray matter density and temporal lobe volume in peripheral hearing loss [41]; Cortical reorganization observed in early stages of cognitive impairment with hearing loss.[41]


WHAT IS THE
GOOD
NEWS?

Hearing Aids and Cochlear Implants: A Lifeline

- ★ Provide more access to sound which supports auditory processing
- ★ Improve listening abilities and communication
- ★ Have beneficial effects on cognition
- ★ Mitigate the risk of cognitive decline and dementia

AI is now in Hearing Aids

Machine learning

Allows computers to make predictions or recommendations by learning data over time

Environmental Classifier

Deep learning

Advanced type of machine learning that analyzes large, complex amounts of data in ways that are inspired by the human brain

Check My Fit

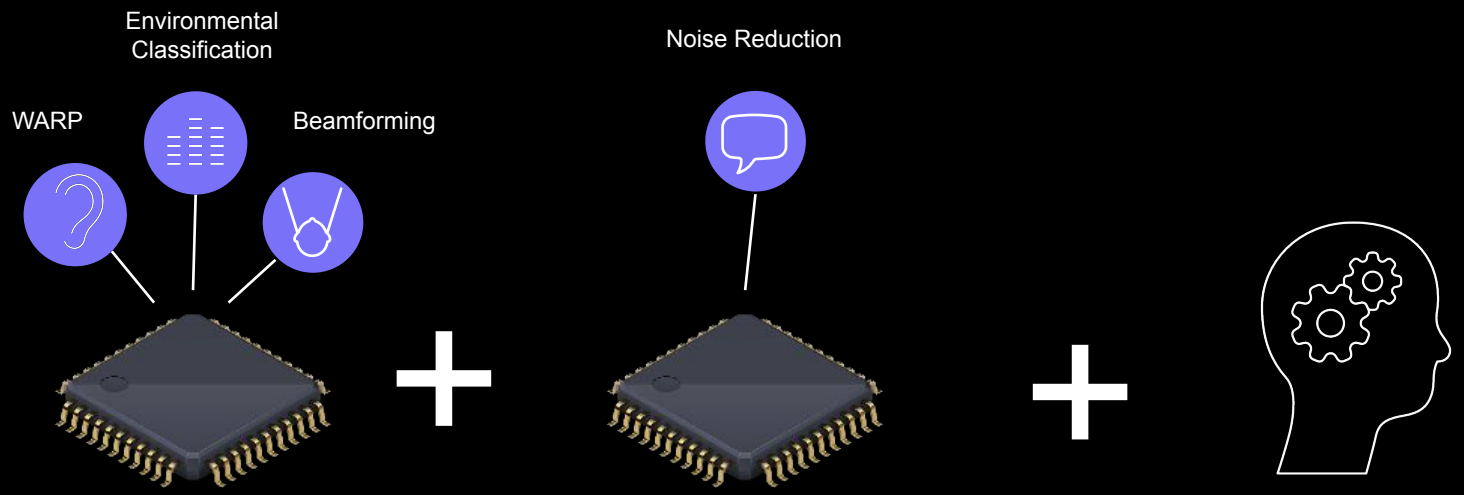
Deep Neural Networks (DNN)

The “muscle” behind deep learning –a layered structure of connected “nodes” or “neurons.” Each layer processes data step-by-step to recognize complex patterns

Intelligent Noise Tracker

DualChip

The highest form of Intelligence Augmented

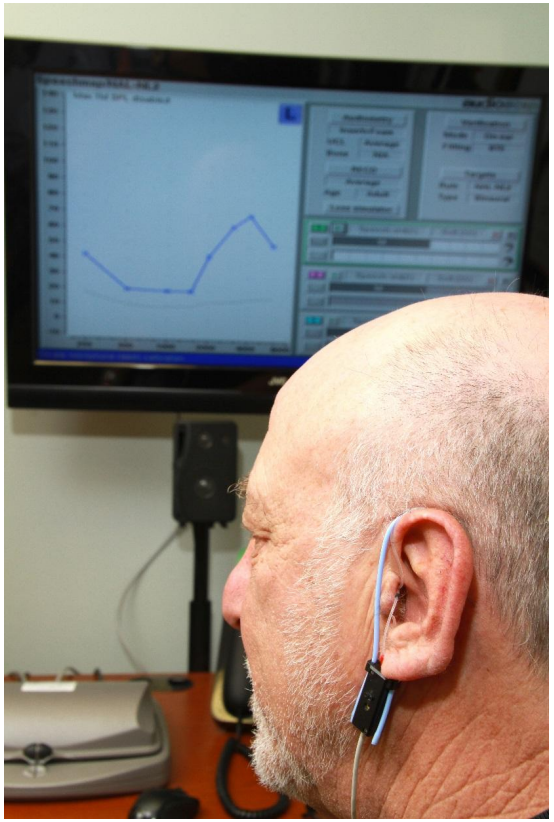


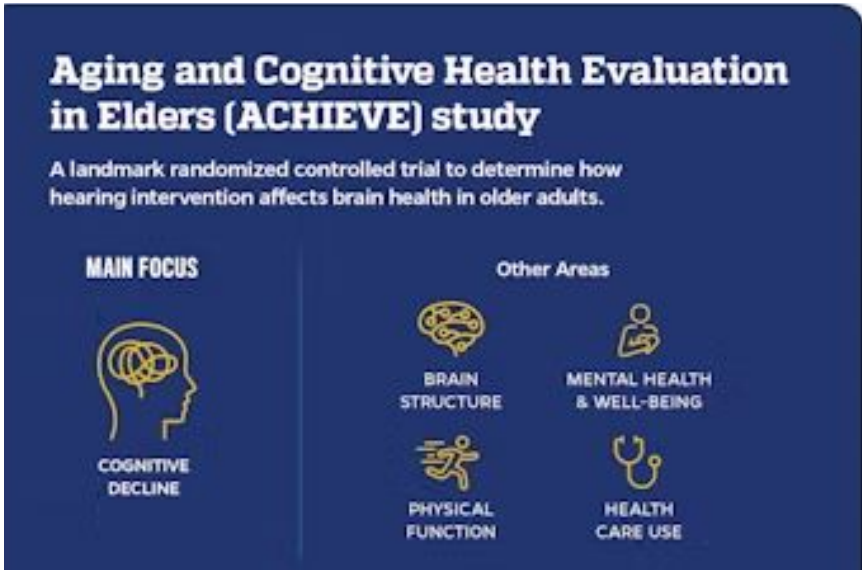
360 Chip
Co-processor

DNN Chip
Co-processor

Human brain
Core processor

Role of Real Ear Verification
BEST PRACTICE!

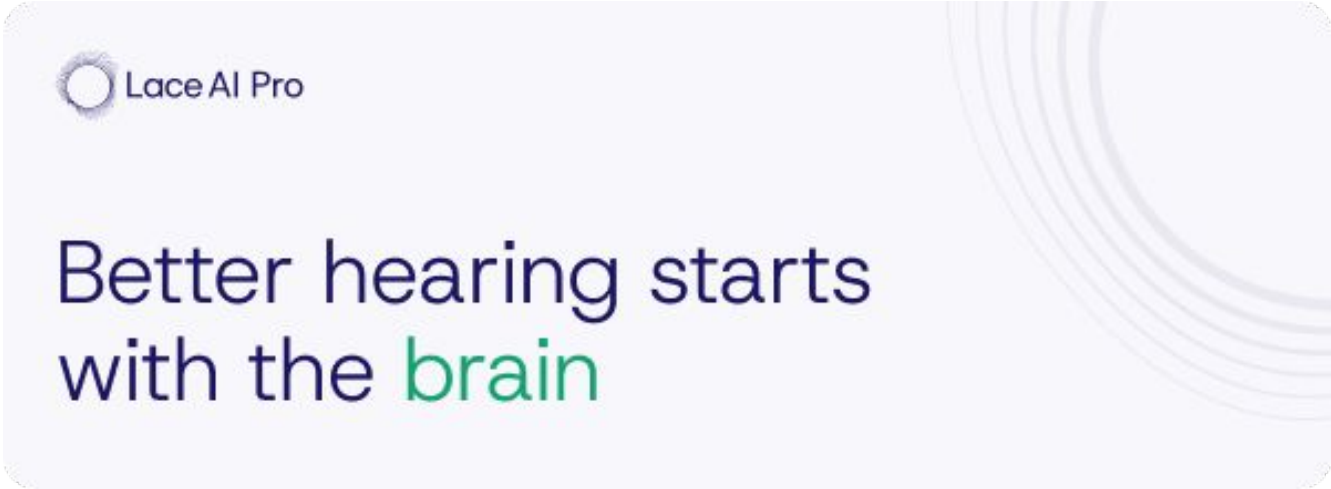



Aging and Cognitive Health Evaluation in Elders (ACHIEVE) study
A landmark randomized controlled trial to determine how hearing intervention affects brain health in older adults.
MAIN FOCUS
COGNITIVE DECLINE
Other Areas
BRAIN STRUCTURE
MENTAL HEALTH & WELL-BEING
PHYSICAL FUNCTION
HEALTH CARE USE


THE LANCET
"Based on evidence from the ACHIEVE study, hearing loss might be a particularly important global public health target for dementia prevention efforts."
Editorial
Comment
Articles
Articles
Seminar

Study	Intervention	Population	Key Cognitive Outcomes
ACHIEVE Study [3]	Hearing aids vs. health education	Older adults (70-84 years) with untreated hearing loss	**Nearly 50% reduction in rate of cognitive decline in high-risk subgroup over 3 years.**
SENSE-Cog Study [85]	Glasses and hearing aids	Participants with dementia	**Improved quality of life measures in multiple areas.**
University of Melbourne Study [99]	Cochlear implants	Older Australians with severe to profound hearing loss	**Significantly improved executive function and working memory; stability in other cognitive functions over 4.5 years.**
Meta-analysis by Yeo et al. [74]	Hearing aids and cochlear implants	Individuals with hearing loss	1**9% decrease in hazards of long-term cognitive decline**.
Cantauria et al. [74]	Hearing aid use	Adults 50+ years with hearing loss	**Lower dementia risk in hearing aid users compared to non-users.**

Auditory Training



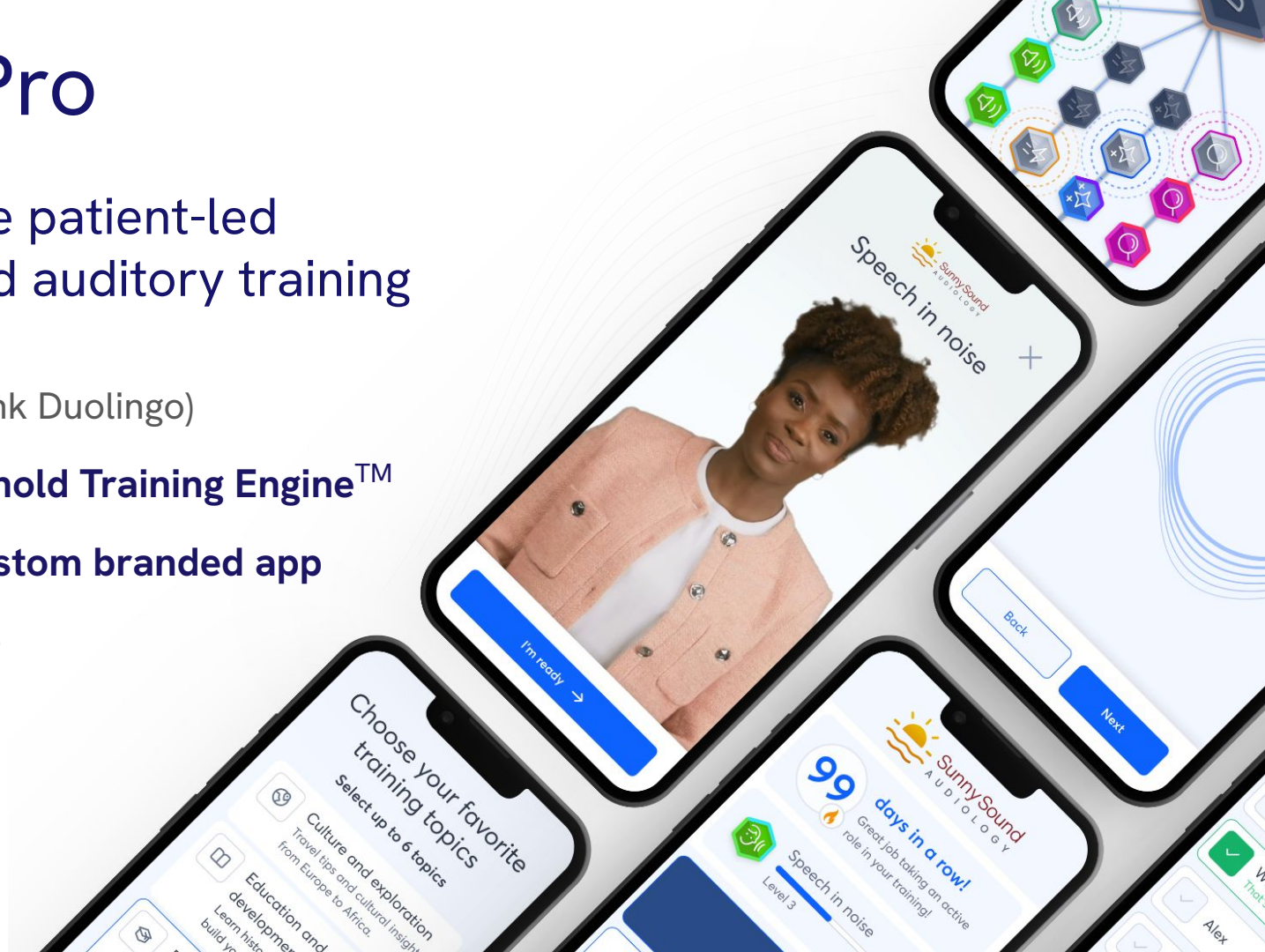
Lace AI Pro

Lace A Pro AI-powered Auditory Health Platform

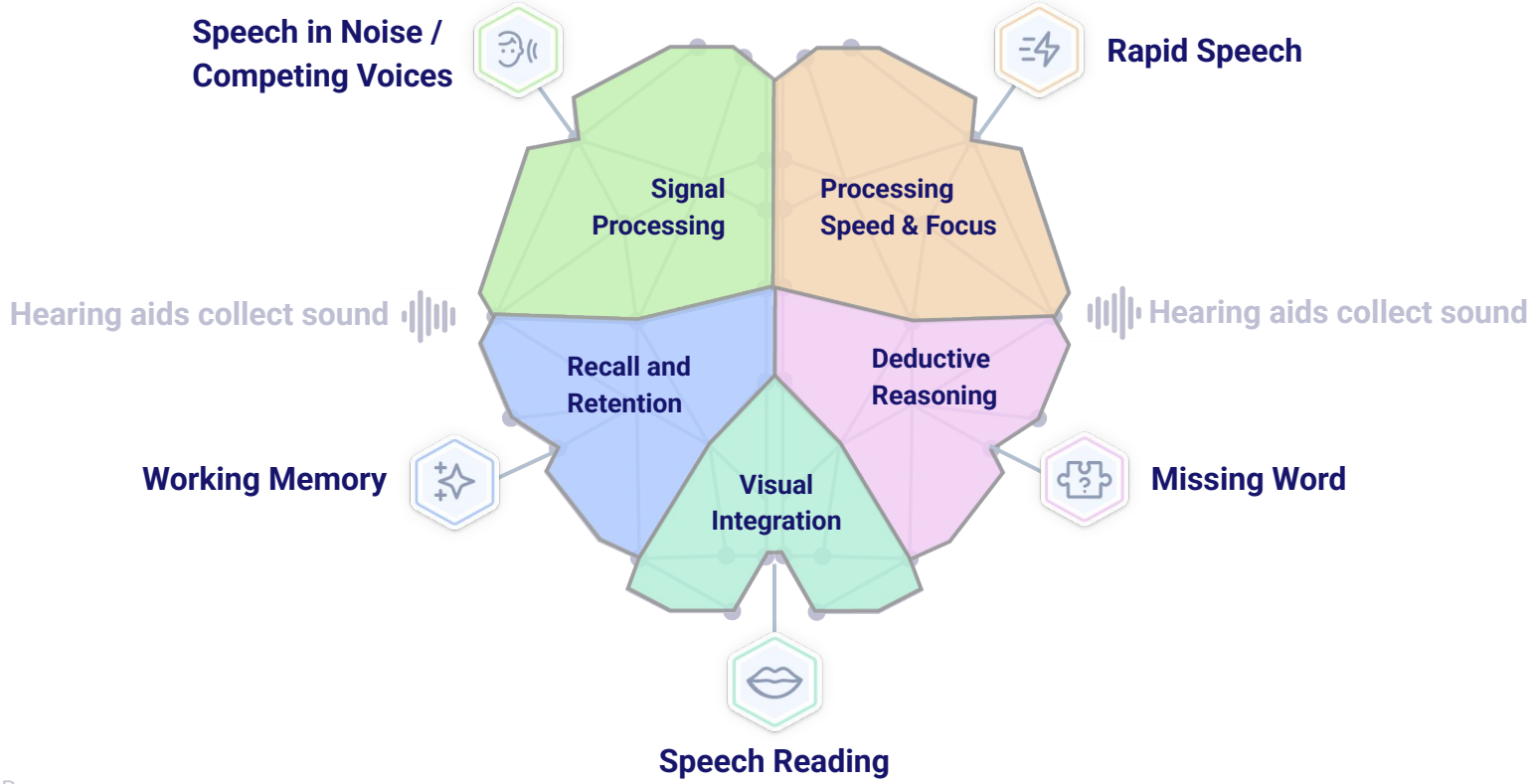
Lace AI Pro

Comprehensive patient-led aural rehab and auditory training

- **15 min day** (Think Duolingo)
- **Dynamic Threshold Training Engine**™
- **Your clinic's custom branded app**
- **Lifetime license**



5 ways we help the brain



Lace AI Pro

Comprehensive auditory training

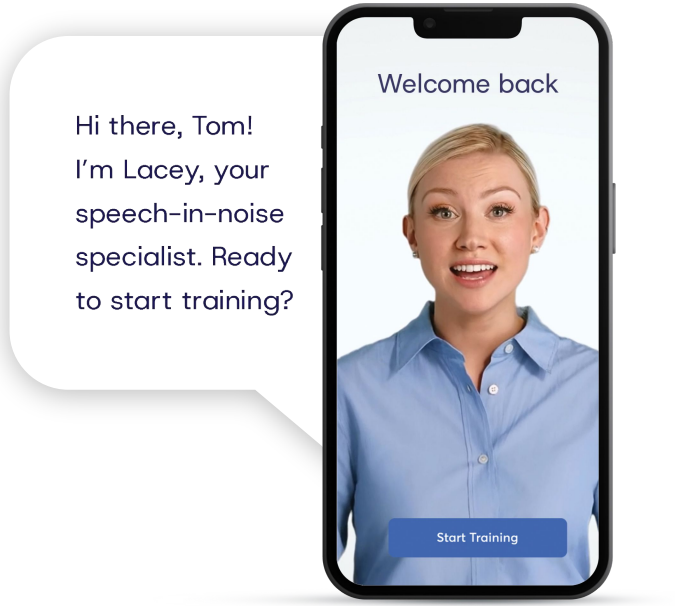
Working Memory • Missing Word • Speech-in-Noise • Rapid Speech • Speech Reading

Education

Best practices • Hearing aid advice • Communication strategies

Voices

Patients train with loved ones voices for more meaningful and effective training



Content

10,000 exercise across 27 topics makes training engaging

Gamification

Notifications • Streaks • Awards • Challenges • Kudos & social

Patient-clinic engagement

Clinician kudos • Progress tracking • Appt. support • Lace SIN testing

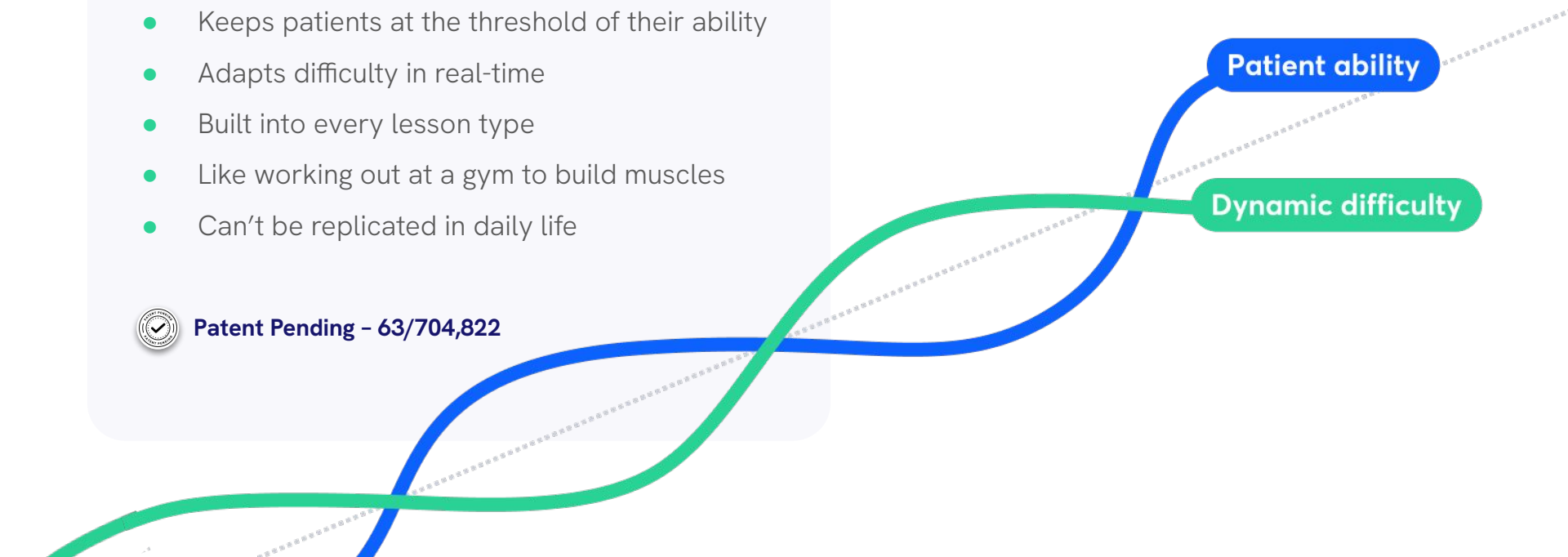
Anytime, Anywhere • Powered by DTT™

Available on iOS, Android, and desktop.

Dynamic Threshold Training Engine™ rewires the brain through neuroplasticity (video)

- Keeps patients at the threshold of their ability
- Adapts difficulty in real-time
- Built into every lesson type
- Like working out at a gym to build muscles
- Can’t be replicated in daily life

Patent Pending – 63/704,822



New Treatments for Tinnitus

"...only my ears whistle and buzz continuously day and night.

I can say I am living a wretched life."

--Ludwig Von Beethoven

What is Tinnitus?

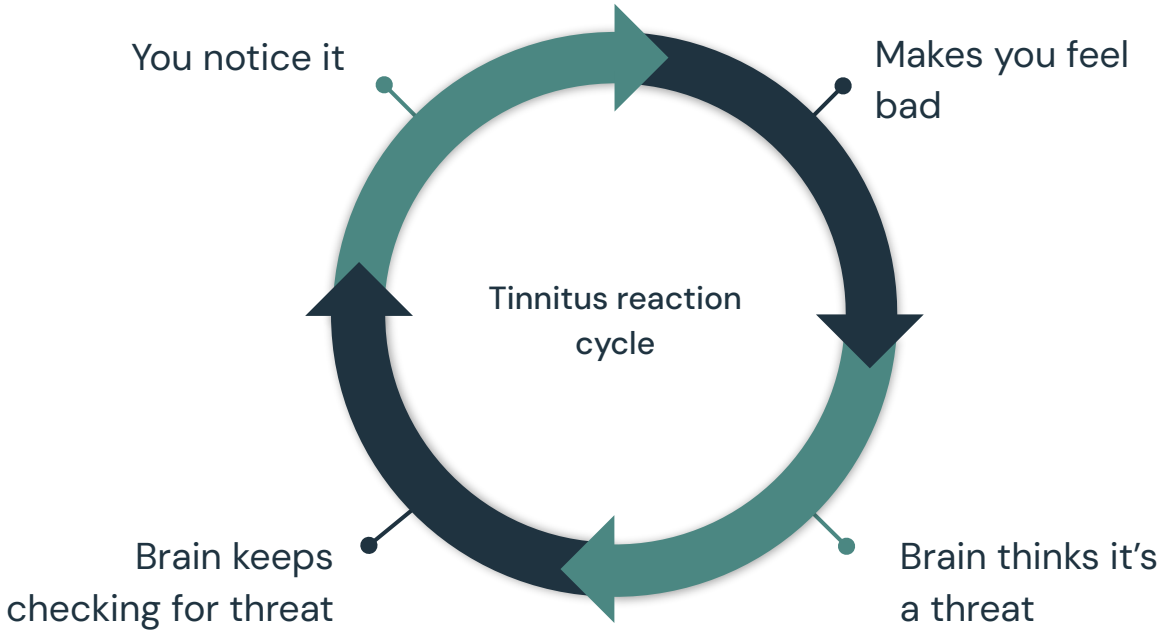
tin·ni·tus [“*TIN-it-us*”, “*tin-NITE-us*”]

noun *Pathology*

a constant or intermittent sound heard in the ears and/or head that does not have an outside source, often described as ringing, humming, or buzzing

Should hearing loss and tinnitus be managed the same way?

Why do we notice tinnitus?



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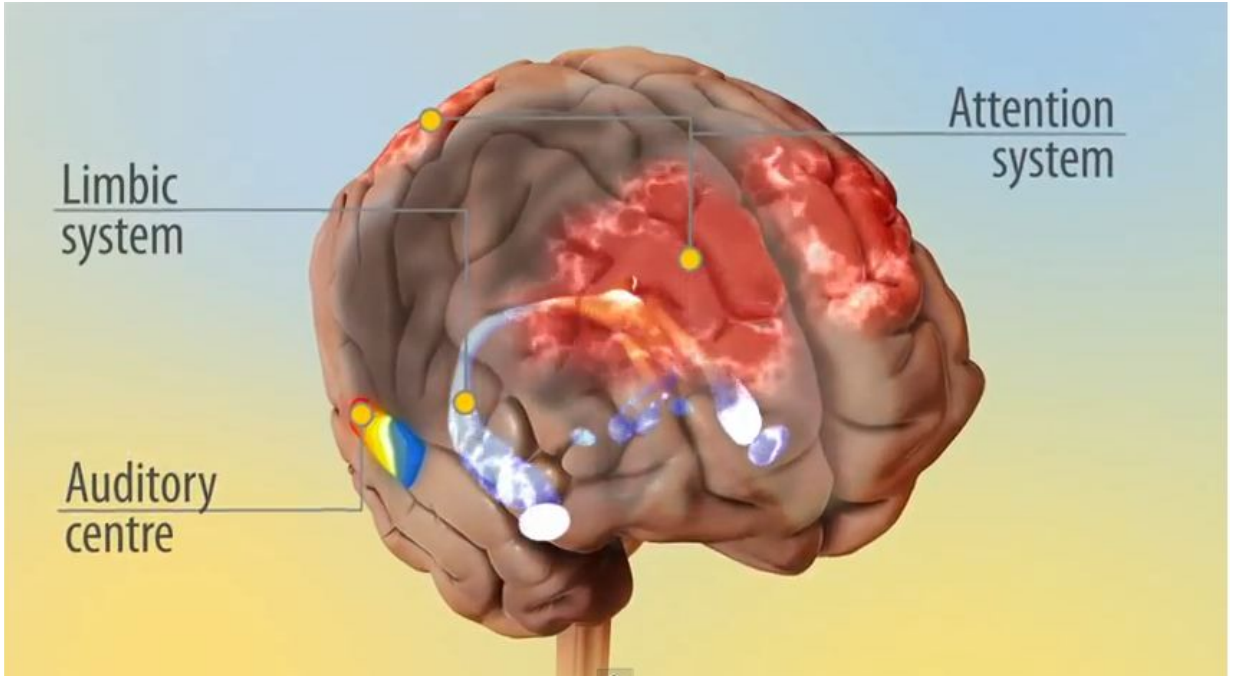
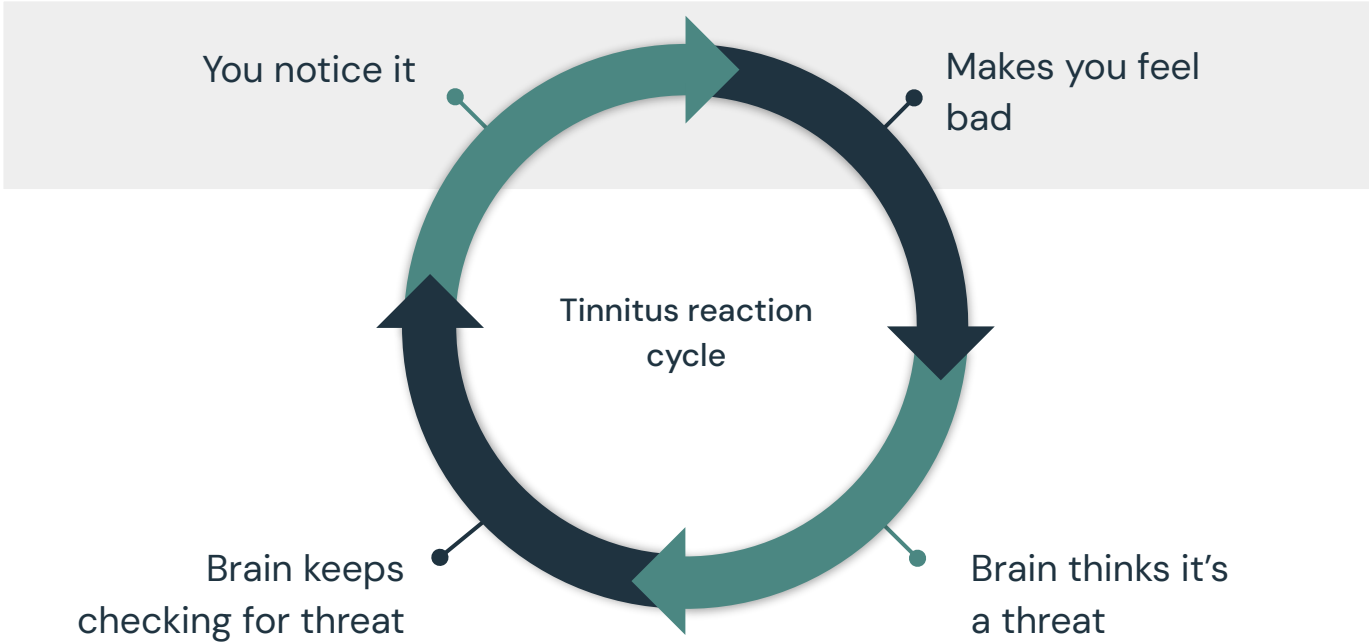
oto pro



We interrupt the cycle...



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Three things then happen...

1. Your tinnitus sounds quieter
2. You stop noticing it
3. It stops bothering you


oto
Tinnitus relief
in 10 minutes a day

Hudson Valley
AUDIOLOGY CENTER

Rewire your brain to stop hearing tinnitus

- Science based 12-week tinnitus program
- Proven to be effective in 3 clinical trials
- Simple 10 minute daily audio sessions

How it works

1 Audiologist Set Up

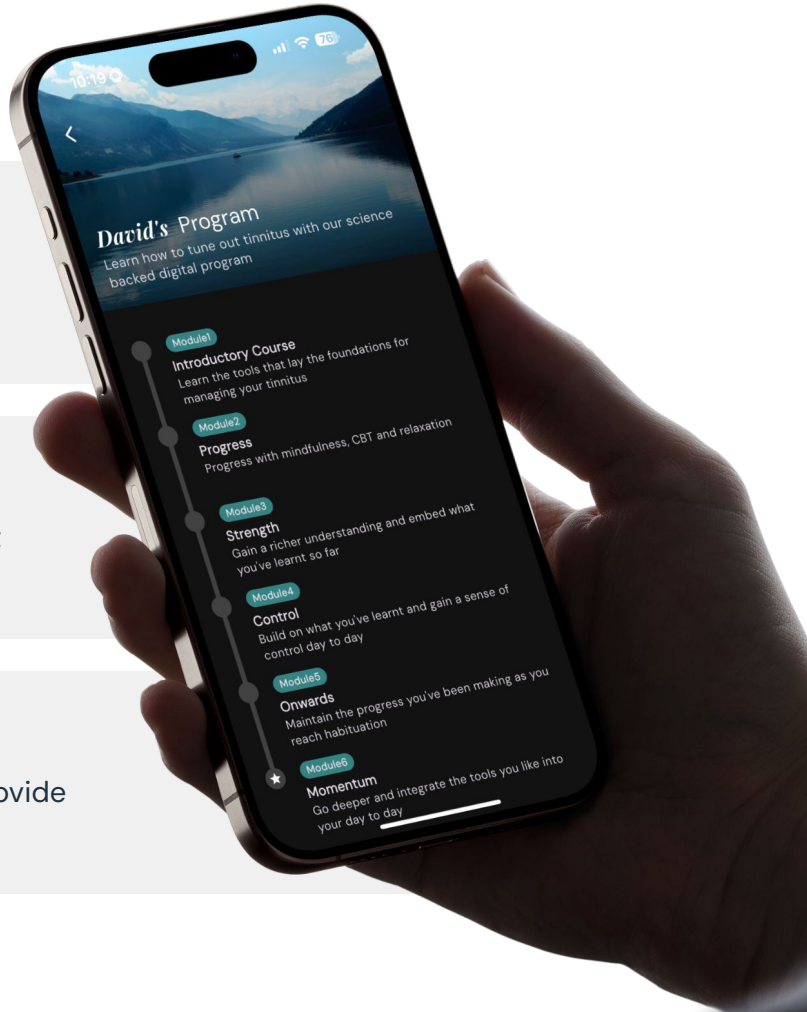
After an in depth tinnitus assessment your provider will set up your personalised program.

2 Work through your program

Do a 10 minute audio session each day. You will learn to tune out tinnitus using cognitive behavioral techniques (CBT).

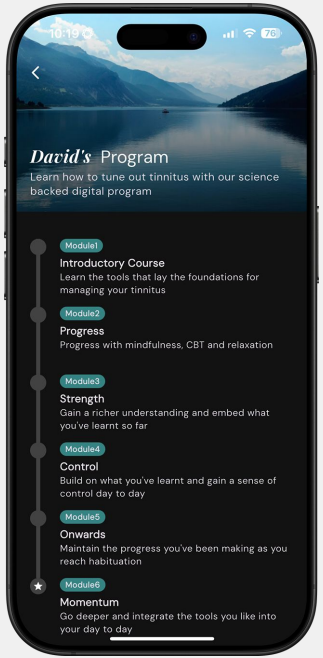
3 Review progress

Your provider will see you at 4-6 weeks review your progress, provide additional support and update your program if needed.



Oto can be combined with other Treatments

Start on day 1



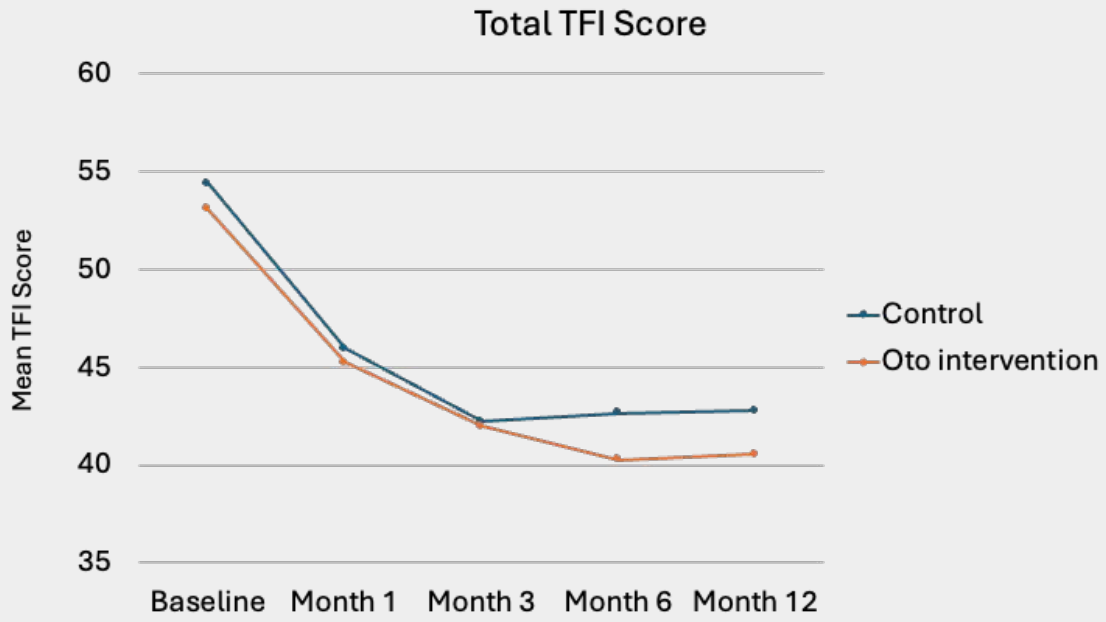
Oto is as effective as Face-to-face CBT Therapy

210

Patients

Control Group

In-Person One on One CBT



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oto

UNIVERSITY OF CAMBRIDGE

What is Lenire?

Clinically proven,
FDA approved tinnitus
treatment device.

What makes up Lenire?

TONGUETIP®
A proprietary intra-oral device, ergonomically designed to sit comfortably in the closed mouth. Tiny electrodes on the Tonguetip deliver mild and safe energy pulses to activate nerves from the tongue.

HEADPHONES
A set of Bluetooth wireless headphones for use specifically with the controller are provided as part of the Lenire package. They are paired to the controller and deliver customized sounds to activate the auditory nerve.

CONTROLLER
A lightweight handheld device that controls the timing and intensity of the treatment. Patients can start, pause and resume the treatment session, adjust the volume of the sound, and adjust the level of the tongue stimulation.

How does Lenire work?

Lenire’s bimodal neuromodulation delivers mild electrical pulses to the tongue combined with sound played through headphones to drive changes in the brain to reduce tinnitus severity.

How Lenire Works

Hearing Aid Users Received Additional Benefit in Their Tinnitus Treatment Journey with Lenire® Bimodal Neuromodulation

10 – 14 WEEKS

START OF TREATMENT → END OF TREATMENT

214 Patients

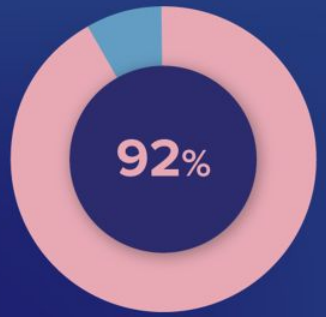
treated bothersome tinnitus

88

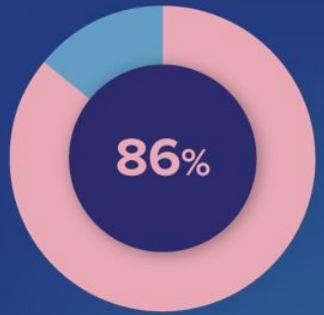
Hearing aid users

126

Non-hearing aid users



Hearing aid users benefited from treating tinnitus with Lenire.



Non-hearing aid users benefited from treating tinnitus with Lenire.

Dr. Emily E. McMahan, Hearing Aid Users Received Additional Benefit in Their Tinnitus Journey with Lenire® Bimodal Neuromodulation Treatment. A retrospective review from Alaska Hearing & Tinnitus Center, Audiology Online, January 2025

Key takeaways

- Lenire offers an option for tinnitus treatment for patients not yet seeking hearing aids.
- Lenire enhances tinnitus relief for hearing aid patients seeking further improvement.
- Lenire can provide clinical meaningful benefit beyond hearing aids.
- Patients should actively communicate their preferences, ask questions, and discuss treatment options.

Are there any contraindications for Lenire?

Lenire is intended to treat patients 18 years of age and older suffering from at least moderate, subjective tinnitus

Lenire is not suitable if:

- You have a pacemaker, defibrillator or any other active implantable device.*
- You are pregnant.*
- You suffer from epilepsy or any other condition that may result in loss of consciousness.*
- You suffer from any condition that causes impaired sensitivity of the tongue.**
- You have oral cavity inflammation, sores or lesions that may contact the Tonguetip.**
- You are suffering from any intermittent or chronic neuralgia in the head and neck area.*
- If you have Meniere's disease.* Lenire use has not been evaluated for Meniere's disease.
- If you have objective source tinnitus.
- In the presence of oral piercings.

*Unless directed by a physician.

**Unless directed by a physician or dentist.

LENIRE®

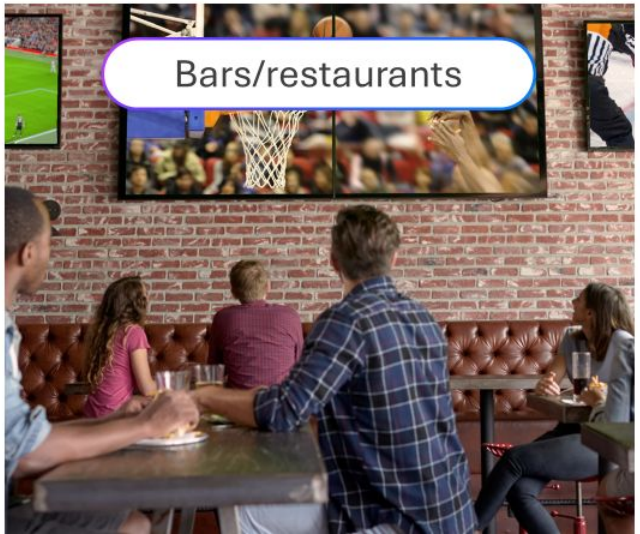

AURACAST™
A BLUETOOTH® TECHNOLOGY


Houses of worship


Theatres

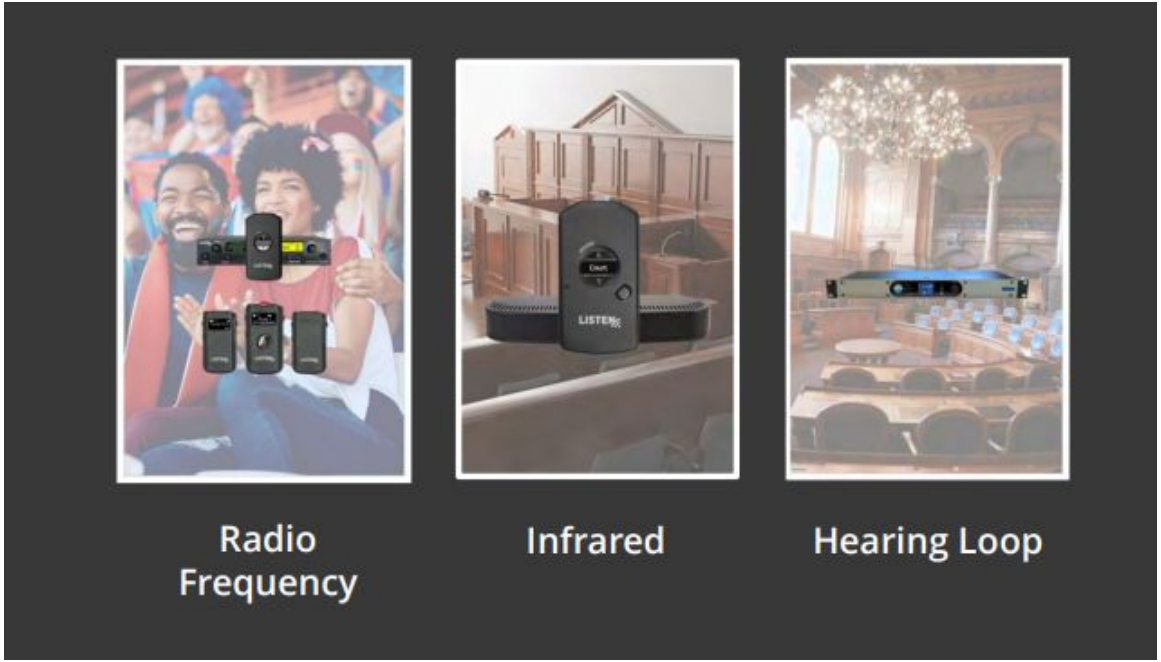

Universities


Conference rooms


Bars/restaurants


Conference centers

Assistive Listening Technology



The next generation of Bluetooth® Audio

Bluetooth® Audio

Classic Audio
Audio on Bluetooth Classic

LE Audio
Audio on Bluetooth LE

Higher quality
Better performance
Lower power

New standardization
Increased performance
Global interoperability

AURACAST
A BLUETOOTH® TECHNOLOGY

Broadcast audio
Next generation ALS
Immersive audio experiences

LE Audio and Auracast™ Forecasts

> **"ABI Research expects Auracast™ broadcast audio capabilities to become a standard feature in Bluetooth® audio assistive listening devices,** establishing a variety of innovative audio user experiences ranging from personal audio sharing to augmented and assistive listening in public venues."

Andrew Zignani
ABI Research

3.1B

LE Audio-enabled devices are forecasted to ship annually by 2029

Source: ABI Research

90%

Of new smartphones will support LE Audio by 2027

Source: ABI Research

1.5M

Public locations are expected to deploy Auracast™ broadcast audio by 2029

Source: ABI Research







THANK YOU

HLAA

Hearing Loss Association of America

Westchester Chapter

Hudson Valley
AUDIOLOGY CENTER

www.HudsonAudiology.com

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4.9
★★★★★
38 reviews

845.694.7881

Pomona, NY • 11 Medical Park Dr. Ste 205
Goshen, NY • 5 Coates Dr

4.9
★★★★★
157 reviews