Don’t Sweat it! Tips for Better Hearing Success in the Gym.

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National Centre for Audiology and School of Communication Sciences and Disorders
Health & Rehabilitation Sciences

Today's Agenda

1. Hearing loss: what's good to know?
2. Treatment & Rehabilitation
3. Hearing Accessibility at Gyms
4. Tips for Better Hearing Accessibility at Gyms

Thanks to the CCAA, past and present, for your support through collaboration with the NCA: Shannon Belfry, JB Orange, Steve DiCiacca, Anita Christie, Angela Roberts, Dana Van Gorp, and many students who have assisted with data collection.

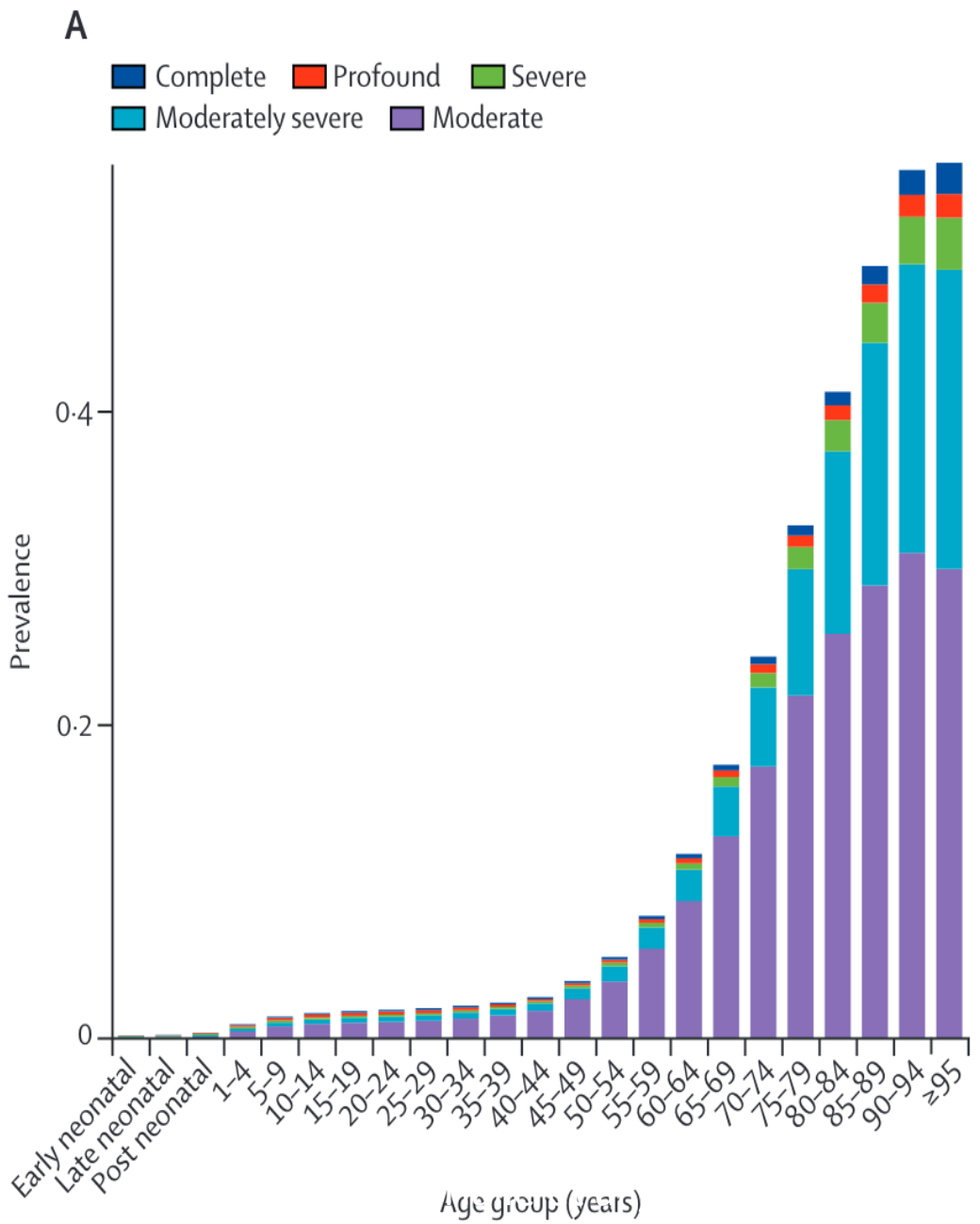
Hearing loss

What does it really mean to have hearing loss?

- Inability to hear specific sounds and process them, which impacts speech understanding.
- It’s more than just a volume control.
  - Clarity of sound
  - High pitches versus low pitches are affected differently.

Hearing Loss is highly Prevalent

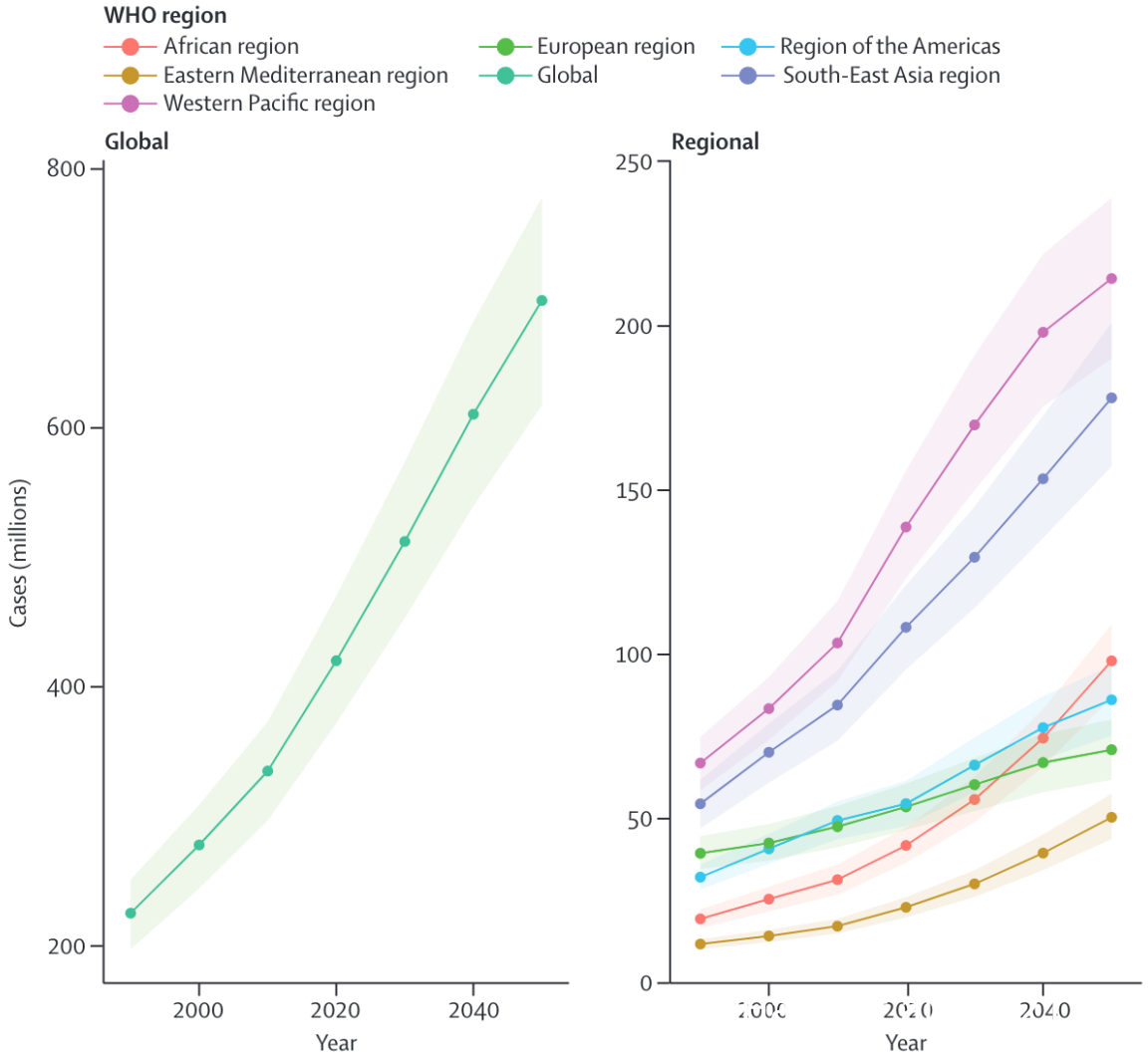
- In Canada, 20% of adults and 7.7% of children have some degree of hearing loss. (Feder et al., 2015, 2017)
- Age-related hearing loss (presbycusis), is the most common type of hearing loss, affecting nearly **65% of older adults** both nationally (Feder et al., 2015) and internationally. (Haile et al., 2021)



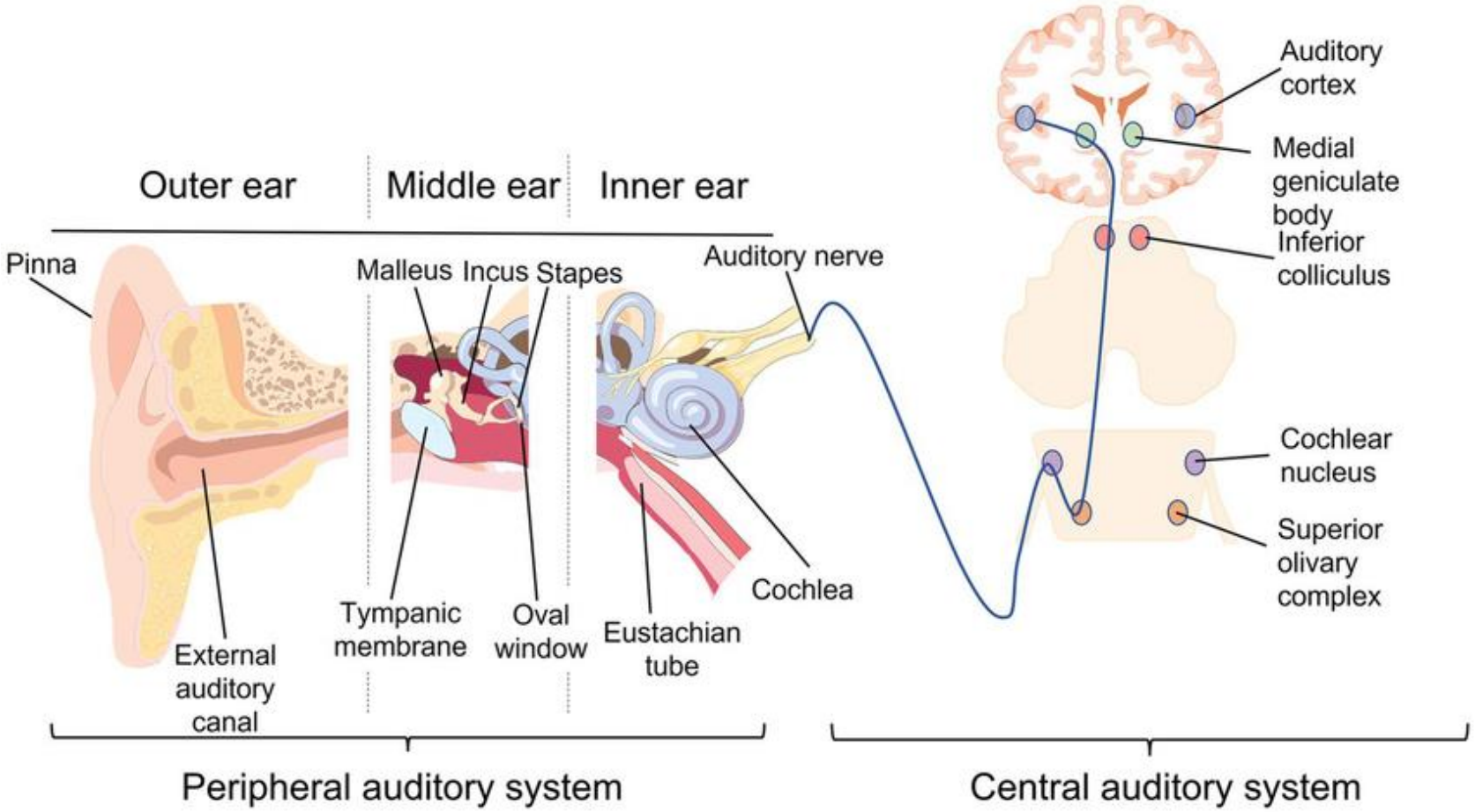
Hearing Loss is Projected to increase dramatically, as part of global increase in older adults.

"The clear association between hearing loss and age means that nearly everyone, if they live long enough, will have some degree of hearing loss."

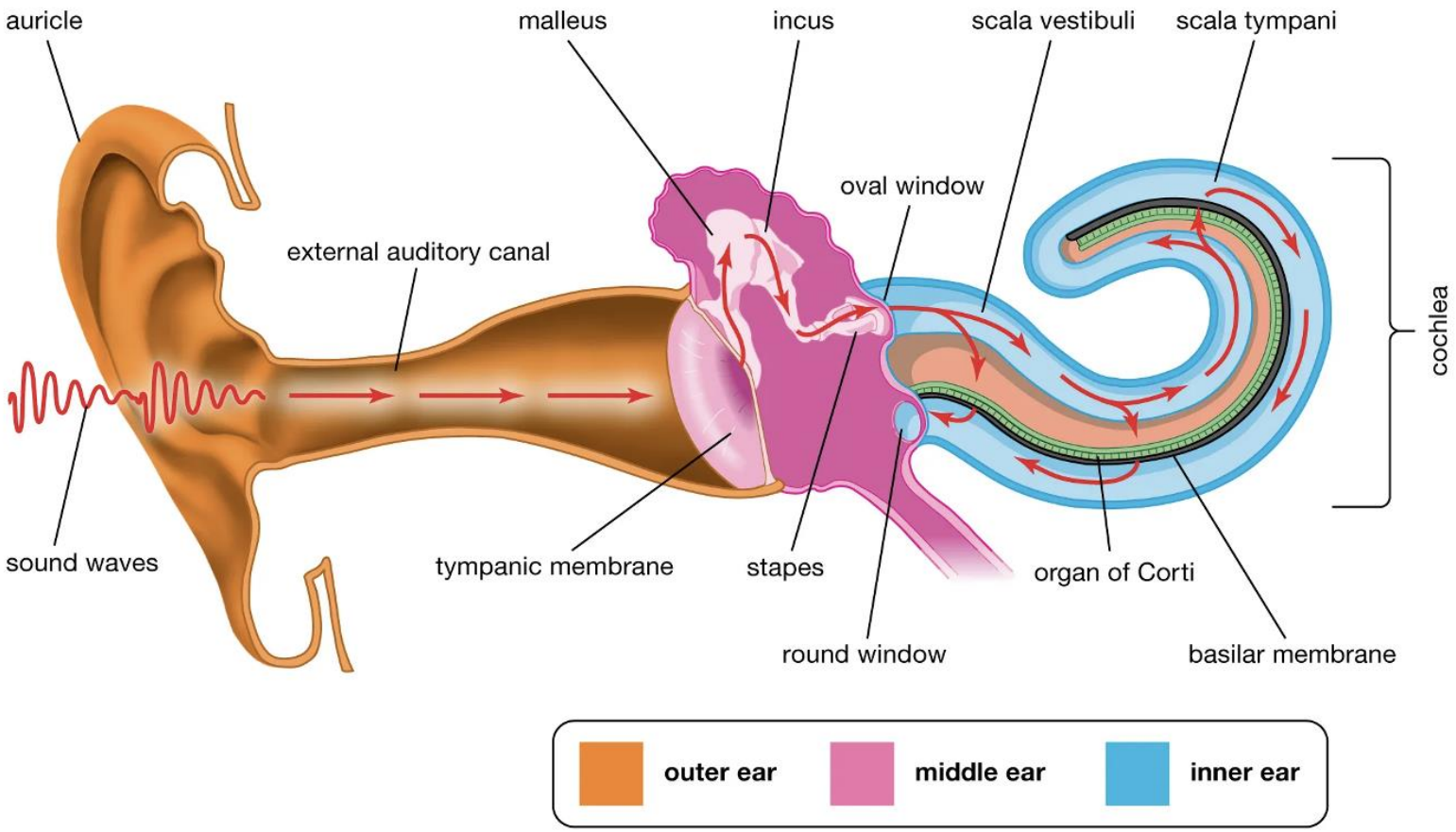
- Global Burden of Disease Study (Haile et al., 2021)



From the ear you see to your brain…

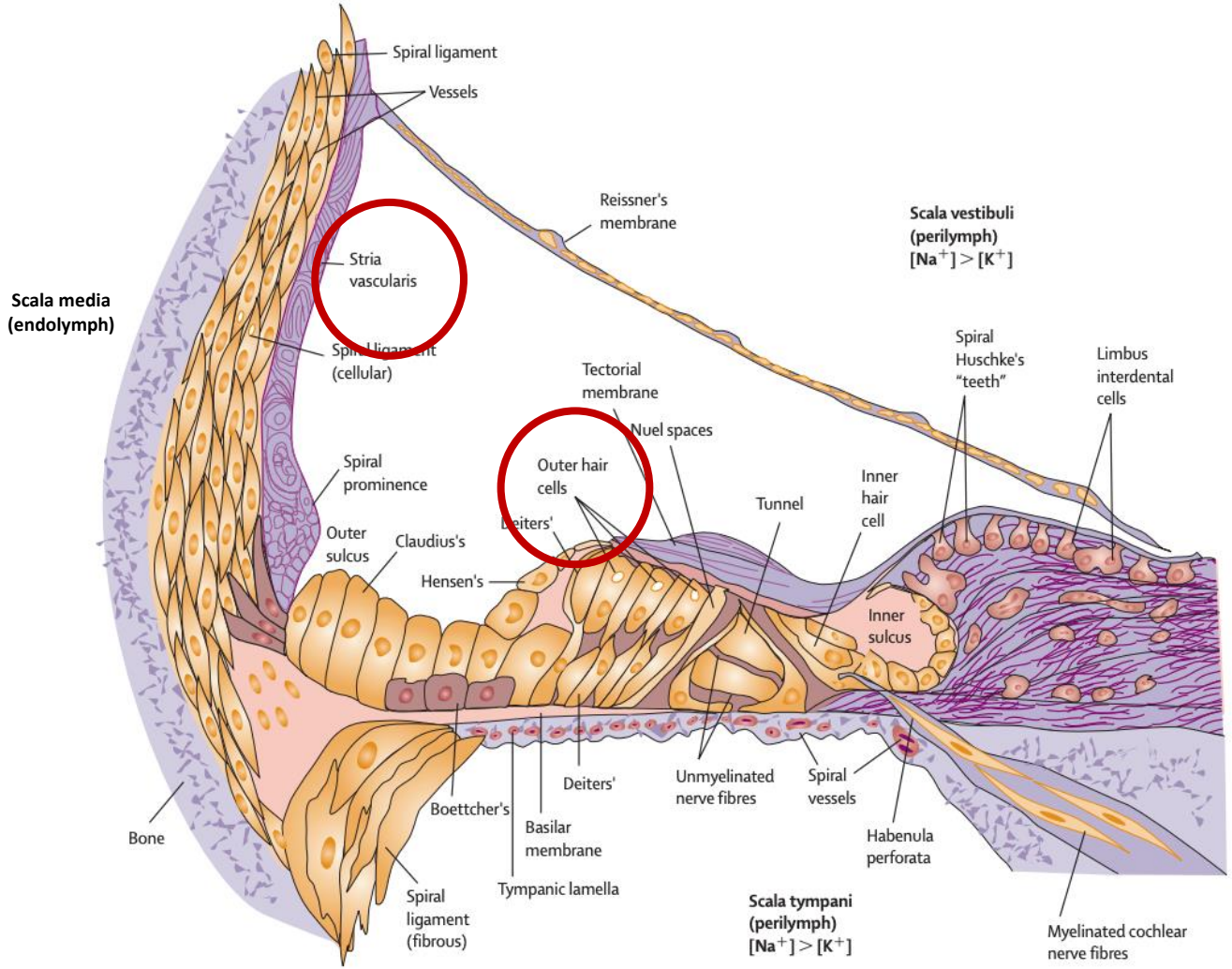


Just the ear…


auricle
malleus
incus
scala vestibuli
scala tympani
oval window
external auditory canal
cochlea
sound waves
tympanic membrane
stapes
round window
organ of Corti
basilar membrane
outer ear
middle ear
inner ear

Just the inner ear… this is the ear's equivalent to the retina in the eye.

Dancing Outer Hair Cell



Gates & Mills, 2005

The Cochlea has high metabolic Activity and is a dynamic, active system.

1. Stria vascularis (battery of the cochlea) is **highly vascularized**, with high oxygen consumption, making it vulnerable to ischemic damage (cardiovascular disease) and leads to mitochondrial dysfunction.
2. Stria vascularis maintains chemical environment of the inner ear and continuously pumping **potassium (K+)** into the endolymph (cell depolarization).
3. Hair cells rapidly convert mechanical sound vibrations into **electrical signals** demanding a constant ATP supply. Outer hair cell adaptively amplify your hearing to help you pick out some sounds from the background.
4. Neural firing rate: Always **constantly active** and rapidly firing.

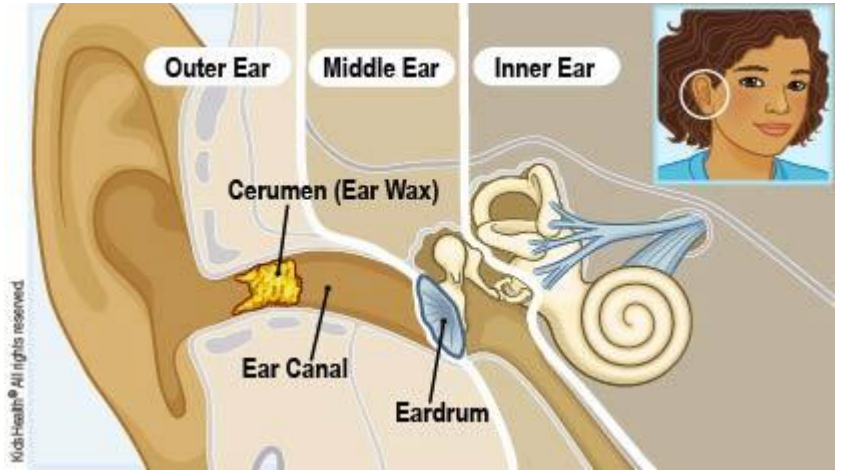
Age-Related Hearing Loss (Presbycusis) is the leading cause of hearing loss.

- Age-related hearing loss is the third most common cause of years lived with disability after low back pain and migraine. (Haile et al., 2021)
- Leading cause for individuals older than 70 years. (Haile et al., 2021)

- In Ontario, community-based care for hearing loss was delisted from OHIP in 2001. This essentially privatized most of our services, and major multinational companies have moved in.
- Coverage for hearing aid purchases for most people in Ontario is provided by ADP. Coverage amounts have been frozen since the mid 1990's at $500 per hearing aid.
- We have a perceived cost problem in the hearing industry… this is part of the reason why.

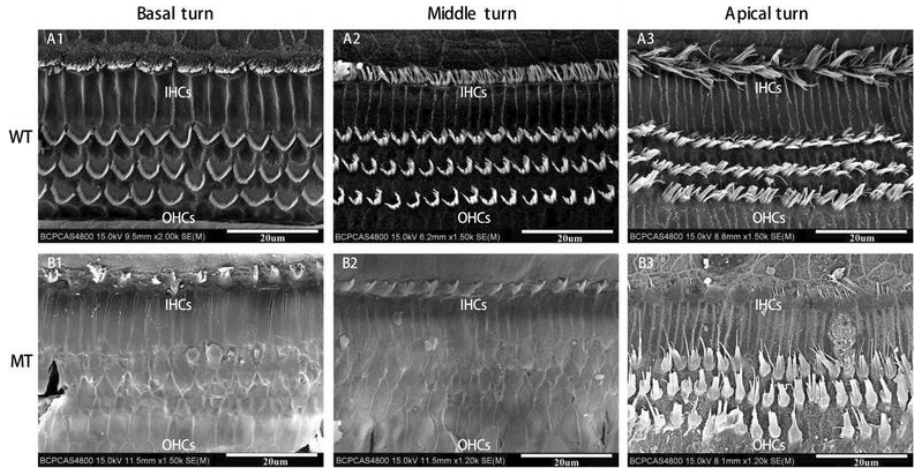
Hearing Loss Types

1. Conductive (passive component of hearing):
   - Anything that acts like an earplug.
   - Example: ear wax, fluid



https://kidshealth.org/en/parents/earwax.html

2. Sensorineural (active component of hearing):
   - Changes to the sensory component (cochlea) or neural pathway (auditory nerve)
   - Example: Presbycusis



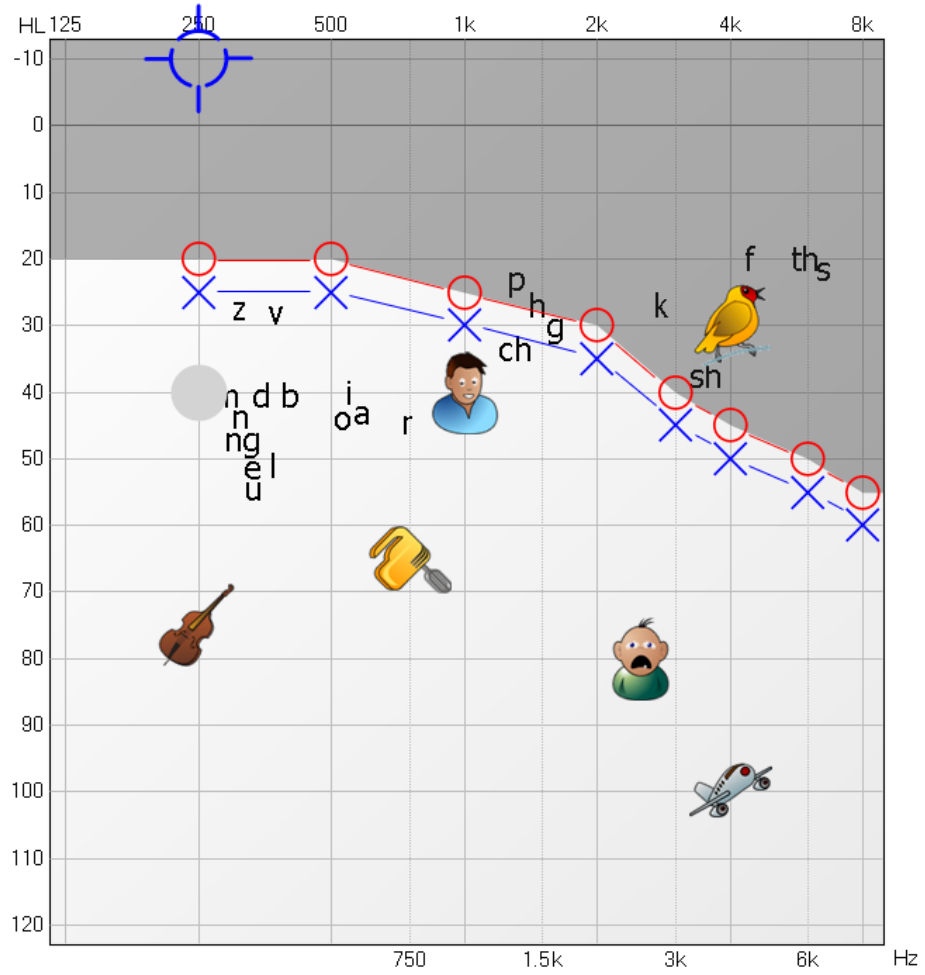
https://www.researchgate.net/figure/Missing-stereocilias-arrow-of-inner-and-outer-hair-cells-in-the-cochleae-of-the_fig5_324899145

Age-related hearing loss (Presbycusis) has subtypes.

1. **Metabolic:**
   - Degeneration of the strial vascularis (Gates & Mills, 2005; Schuknecht, 1964), leading to reduced blood supply (Han et al., 2014; Helzner et al., 2011; Hull & Kerschen, 2010; Lee et al., 2016; Loprinzi et al., 2012; Makishima, 1978), and disruption in cochlea's metabolic activity. (Tasaki & Spyropoulos, 1959)
2. **Sensory:**
   - Primary component involves degeneration of cochlear hair cells, and secondary component results in the atrophy of cochlear neurons.
3. **Neural:**
   - Auditory neuron atrophy. (Schuknecht, 1964)

Two things that people don't know about hearing loss.

1. It causes reduced hearing sensitivity, but it isn't equal across pitches. (Gates & Mills, 2005)
2. Noisy and echoey environments have a greater impact. (Gates & Mills, 2005)



How Does Hearing Loss Affect Older Adults?

1. Reduced hearing sensitivity, especially at higher pitches. (Gates & Mills, 2005)
2. Reduced speech perception, especially in noise and echoey environments. (Gates & Mills, 2005)
3. Cognitive/listening fatigue. (Pichora-Fuller et al., 2016)
4. Cognitive decline. (Livingston et al., 2024)
5. Increased risk of falls. (Campos et al., 2018; Jiam et al., 2016; Lin & Ferrucci, 2012; Viljanen et al., 2009)

Risk of Falling is related to Hearing Loss.
Balance and hearing use a shared organ.

Look right here.

The 3 semicircles are in the 3 planes of space.

Risk of Falling is related to Hearing Loss.

- Effects of presbycusis on **sound processing** (Akeroyd, 2014, Freigang et al., 2015) and neural synchrony. (review by Campos et al., 2018)
- Integration: **cognitive fatigue**. (Pichora-Fuller et al., 2016)
- Similar **age-related declines** are seen within the vestibular system.

  (Jiam et al., 2016; Lin et al., 2011, 2013; Viljanen et al., 2009; Zuniga et al., 2012)
- **Disease:** metabolic and microvascular pathologies. (see reviews by Campos et al., 2018, Viljanen et al., 2009)

Services for prevention and rehabilitation: What does an Audiologist do?

Prevention & Rehabilitation

- Hearing protection to prevent hearing loss.
- Communication Strategies (closed-captioning, conversational repair).
- Strategies on room acoustics and room systems.
- Hearing aids or Cochlear Implants.
- Assistive listening devices: other hearing accessories that help people to function in a wider range of environments.

Applying This to Fitness Instruction for older adults

- By 2068, older adults, among whom hearing loss is highly prevalent, are projected to account for one-fourth of the Canadian population. (Stats Canada 2018)
- Those with hearing loss are even far less active (Assi et al., 2024), and more sedentary (Kuo et al., 2021; Loprinzi, 2013).

- Why?

Is Hearing Accessibility the Problem?
Mohamed Rahme's dissertation.

1. What are the key factors related to hearing accessibility in real-world group-based exercise environments?
2. How can evidence-based interventions address these factors?

Why is the Group-Based Exercise scenario so interesting?

- Group-based exercise programs have adherence and re-enrollment rates as high as 75% (Farrance et al., 2016, Gilbert et al., 2017), particularly in groups with demographic homogeneity. (Dunlop & Beauchamp 2013)
- These programs are known to enhance health-related quality of life (McGrath et al., 2011), self-perceived physical health, function (Farrance et al., 2016) and motivation (Gilbert et al., 2017):

"When you get out of there you feel good... it gives me energy."
"For balance... in the beginning I was all crooked and now I can do it, so that improvement is encouraging, it keeps me going."

(Gilbert et al., 2017)

In a nutshell: 110 exercisers answered our PACE survey.

- 57% of those with hearing loss said exercise class was important to their social life.
- 65% of participants went with a friend or family member some or all of the time.
- One third had hearing loss.
- 63% of hearing aid owners wore them to exercise class
  - Sweat, having them fall out, and comfort during exercise were important reasons for those who didn't.
- Crowded, loud studios and microphone system issues were important barriers to successful communication.

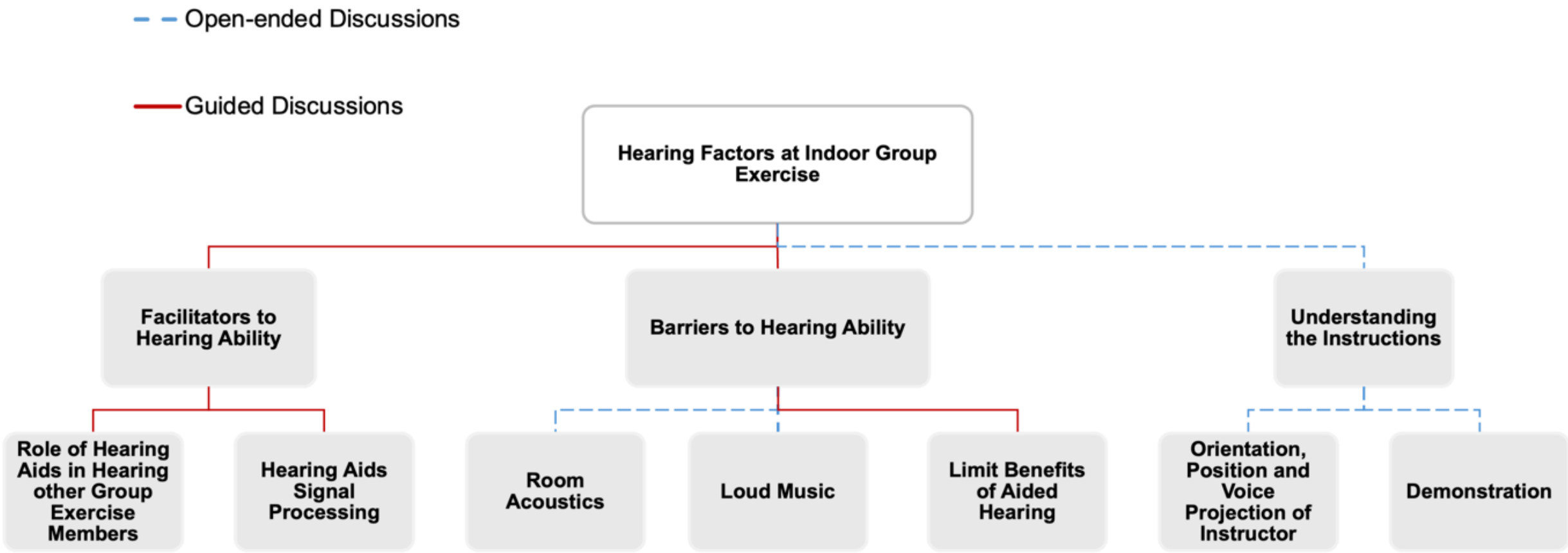
Rahme, M., Folkeard, P., Belfry, S., Orange, J. B., & Scollie, S. (2022). The Relationship Between Self-Reported Hearing Measures and Group Exercise Participation. *The Health & Fitness Journal of Canada*, *15*(3). Available at: https://doi.org/10.14288/hfjc.v15i3.822

Hearing Accessibility in Group Exercise Environments

Effective communication with the fitness instructor

Interactions with fellow exercise members

From Mohamed's research, we know some of the hearing factors that are important to group exercise participants.



Rahme, M., Folkeard, P., & Scollie, S. (2025). A qualitative study of the role of hearing aid use and physical fit accessories in a sample of older adults. *International Journal of Audiology*, 1–9. Available at: https://doi.org/10.1080/14992027.2025.2450660

What is the impact of not being able to hear at group fitness?

- Hearing is important for:
  - Hearing the exercise instructions.
  - The social aspect of hearing for interactions with fellow participants.

You are part of people staying with exercise!

- **Supportive leadership, and clear communication** for maintaining exercise adherence, enjoyment, and satisfaction (Farrance et al., 2016; Gilbert et al., 2017, Dunlop & Beauchamp 2013).
- Group fitness instructors **educate** to avoid risk of injury.
- Foster a supportive, interactive, and socially inclusive **culture** (Gilbert,et al., 2017, Harvey & Griffin, 2020).

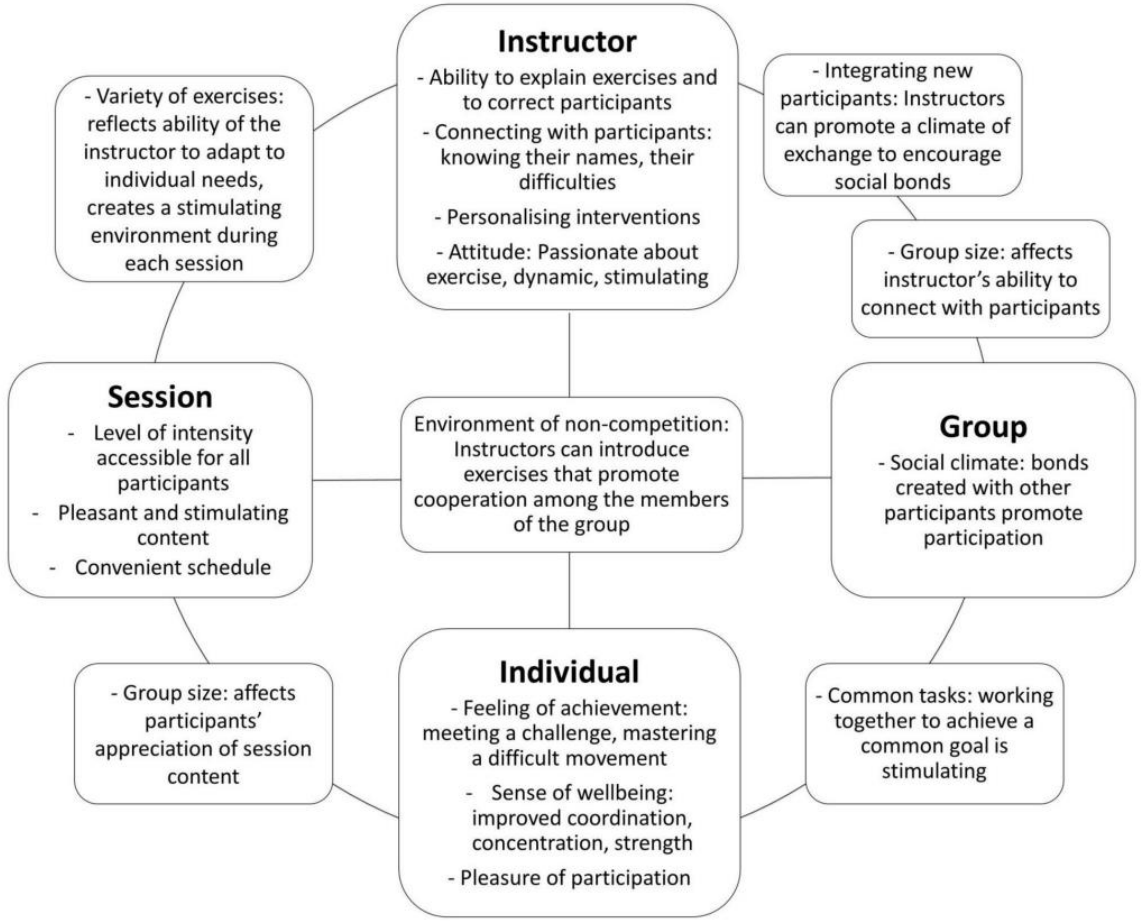


Figure 4. Factors contributing to group-based exercise re-enrollment (Gilbert et al., 2017).

Effective Communication with the Fitness Instructor

"She took the time to ask at the beginning, who had never done it before, and she was careful during the class, she showed the movements and paid attention to us. It's thanks to her that I'm still here today."

(Gilbert et al., 2017)

Interactions with Fellow Exercise Members

"You get out of the house, see people, that helps create bonds."

"The group is really what's keeping us together, because I don't think I would have done this for 15 years alone in my basement."

(Gilbert et al., 2017)

Can Hearing Aids Address These Issues?

- Hearing aids offer **signal processing features** that facilitate communication, comfort in noise, and user satisfaction. (see full review by Saleh, 2023)
- Hearing aids have been linked to improvement in hearing ability (Avierinos et al., 2024), social and physical activities, psychosocial well-being, health-related quality of life (Avierinos et al., 2024; Chisolm et al., 2007; Holman et al., 2021; Tsimpida et al., 2022), self-reported communication function (Sanchez et al., 2024), reduction in listening fatigue (Avierinos et al., 2024)

Hearing Aid Retention during exercise is a major concern.

- The fear of device loss or damage was related to the cost of replacing the aids.

“I think it certainly limits what options I have with having a hearing aid, so I prefer to have it out. And also… if you're running say, half a marathon and you've got a hearing aid in, there’s a very high chance of it coming lose and then you losing it, and they are quite expensive!”

(Goodwin et al., 2024)

Hearing Aid Retention Accessories are available and offer lots of choices.

- In pediatric hearing aid fittings, protocols and directions for physical fit considerations are common clinical practice, with resources available in the literature (Anderson & Madell, 2014; Roush & Jones, 2018) and in textbooks. (Tharpe et al., 2017)

Ear Gear

Spandex sleeve slips over hearing device. Has stretch cord and plastic locking clip.

PROS: Stretchy cord, allows for full range of head motion. Spandex sleeve protects from mess/damage and from hearing aids being swallowed by infants. Plastic clip to clothing has no sharp edges, is hypoallergenic and locks to make it extremely difficult for a child to remove. Spandex sleeve increases comfort of device wear; prevents and assists in healing from chafing; also diminishes wind noise. Comes in many different colors to increase child's interest and pride in wearing hearing aids. Use with hearing aids, cochlear implants and BAHA for individuals of all ages. Models can attach to one or two hearing devices.

CONS: Some difficulty installing, because earmold must be removed and then reattached.

www.gearforears.com

Caps

Caps cover hearing devices securing them from busy or yanking fingers.

PROS: Effective at discouraging toddlers from yanking hearing aids off. Washable and durable. Hanna Andersson and Hearing Henry caps are cotton and have ties long enough to cross in front of neck and tie behind. Silkawear caps have mesh side panels and fasten securely under chin via Velcro. Discontinue after toddler 'yanking' phase subsides so child can practice putting on hearing aids (should be independently putting hearing aids on by age 3). Use with hearing aids, cochlear implants and BAHA. Come in various colors.

CONS: Warm for summer or southern climates.

www.silkawear.com
www.hannaandersson.com
www.hearinghenry.com

Safe-N-Sound

Plastic loop slips over hearing device. Has poly cotton cord and metal alligator clip.

PROS: Easy to Install. One size fits all hearing aid and cochlear implant models. Flexible cotton cord comes in many different colors to increase child's interest and pride in wearing hearing aids. Option with barrette can be effective to discourage young child yanking out the hearing aid, while not causing discomfort when removed by parent. Used by children of all ages. Models can attach to one or two hearing devices or be used with eyeglasses. Works with hearing aids, cochlear implants, and BAHA.

CONS: Nonstretch cord. One size loop may not tightly fit all hearing instruments. The Alligator clip has nickel content, and can cause allergic reactions.

www.getsafensound.com

Wig / Toupee Tape

Tape specifically made for use on skin. Attaches to both hearing device and skin. Must replace tape on a regular basis to maintain security.

PROS: Good short-term strategy. Tape does not require much of a 'tug' to remove hearing aid, but is helpful in preventing dislodging when child is just starting to use his hands to explore or when the device is large/heavy for the child's ear. Used primarily when child is young or very active. Use on all hearing devices.

CONS: The tape discourages child from pulling the hearing aid off due to possible discomfort when removed – by child or by parent. Child could learn to shy away from hearing aid because it is not comfortable when it is removed. If used frequently, tape can be expensive over time.

Oto / Critter Clips

Plastic loop security system, with thin poly cotton cord and metal alligator type clip. Models that attach to one or two hearing devices.

PROS: Low cost, easy to install solution. One size fits all hearing aid models and implants. Cords come in many colors, and some models are available with cute animals on the face of the clip - encouraging small children to wear their aids. Used by children of all ages wearing hearing aids, cochlear implants or BAHA.

CONS: Breaks easily / not very durable. Cute animals can come off and be swallowed. Security level varies due to one-size fitting for all hearing instruments. The Alligator clip has sharp teeth and may pinch child's skin. Clip has nickel content, and can cause allergic reactions.

www.westone.com

We enrolled a group of adults in CCAA fitness classes and provided them with best-fit hearing aids and hearing aid retention activities. Focus group discussions were used to learn about their experiences.

“I found also being able to hear sounds louder. It wasn’t a case of pardon.”

“I did wear them in places like a coffee shop. And that was significantly better; reduced the noise.”

“I have gotten to know a few people and we would be chatting and I could hear them.”

“If we were in a group chatting after class, I would hear better.”

“When I was warming up, you talk to other members and I did hear them better than when I didn’t have aids.”

They really want to hear YOU.

“She had her back to me and all of us couldn't hear. It wasn't just me. The entire class almost, you know, people would say, well, what did she say, you know, and if she turned around, then obviously, we all heard her.”

“It was clear with the instructor depending on where she was located in the room. But overall, it [hearing aid] definitely did help with exercise.”

Hearing aid users recognize barriers to hearing accessibility and use compensatory strategies.

- “All the background noise and echoes … Looking back on it now, I couldn't hear anything. You know, if I was at one end of the basketball court, and the coach was at the other end yelling instructions and stuff like that. I'd just pretend I'd heard”.

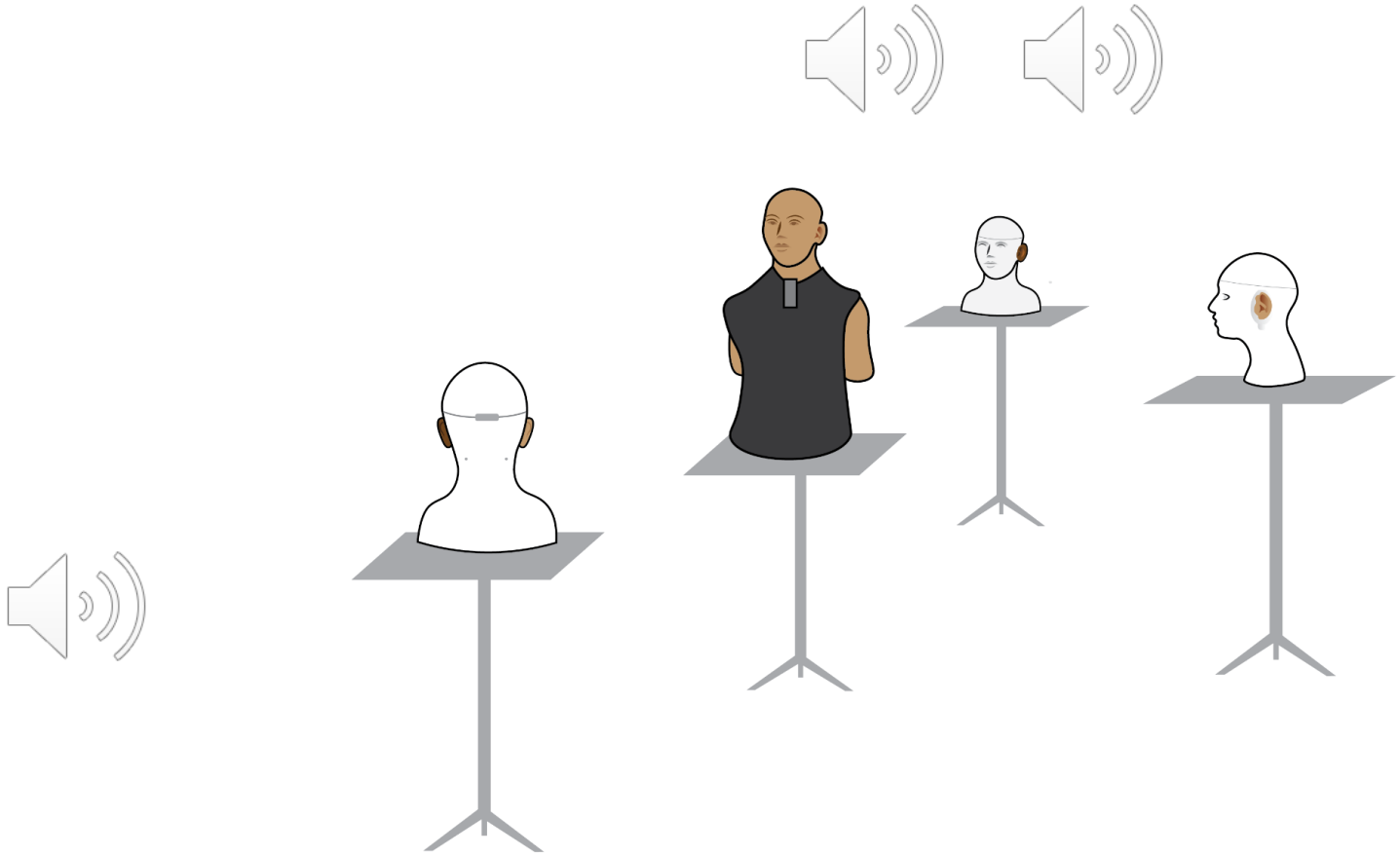
- “I try to get in a space where I've got line of sight. So that, it doesn't matter that I can't hear the instructions I can watch… Because I know I'm not gonna be able to hear especially when there's music, you know? You're like, no chance”.

Similar Outcomes Have Been Reported with Children in Academic Classrooms

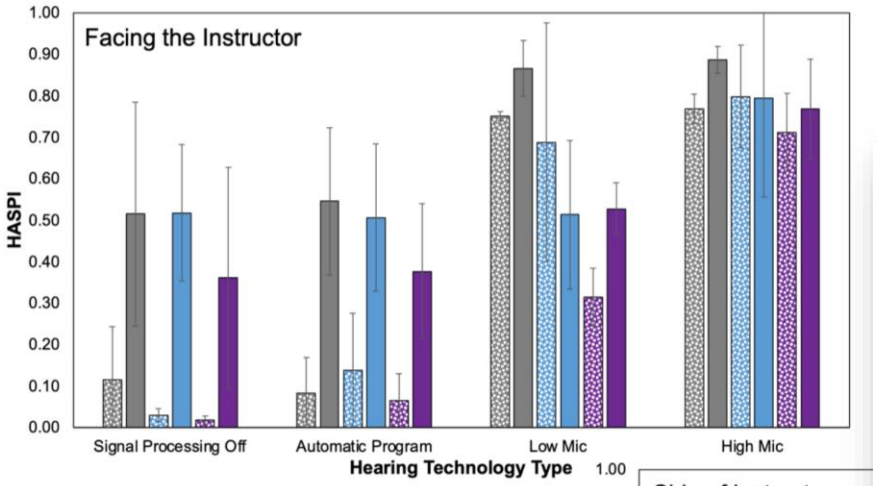
- Hearing aids are effective in improving speech understanding (Magnusson et al., 2013; Picou & Ricketts, 2019; Ricketts & Picou, 2013; Saleh et al., 2022; Wu et al., 2019), and reducing listening fatigue in listeners with hearing loss. (Picou & Ricketts, 2019)
- Optimal benefits are often reported in situations when the listener is facing the talker (Ricketts & Picou, 2013) and not when the talkers are positioned to the side, behind or in unpredictable locations relative to the listener. (Ricketts & Picou, 2013)

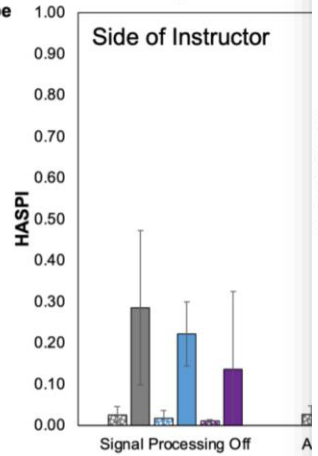
What can a Senior Fitness Instructor do to make it easier?

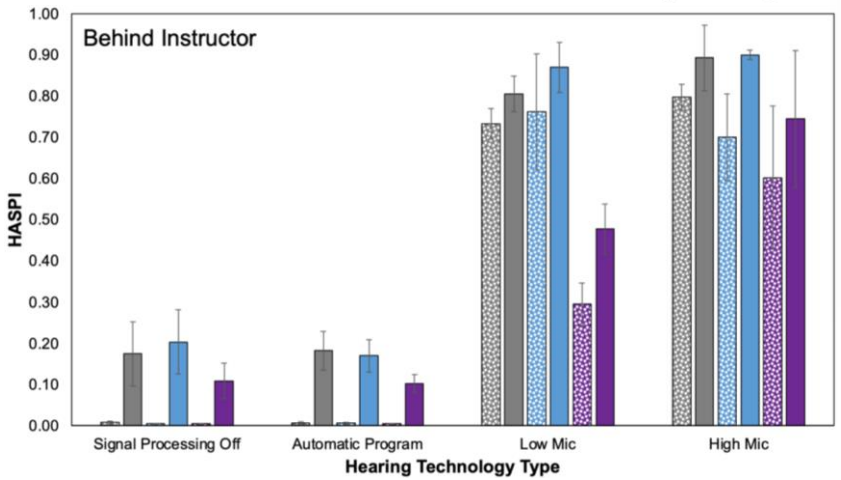
Microphone systems are available in low and high tech varieties. We tested them in a gym and the CCAA studio.

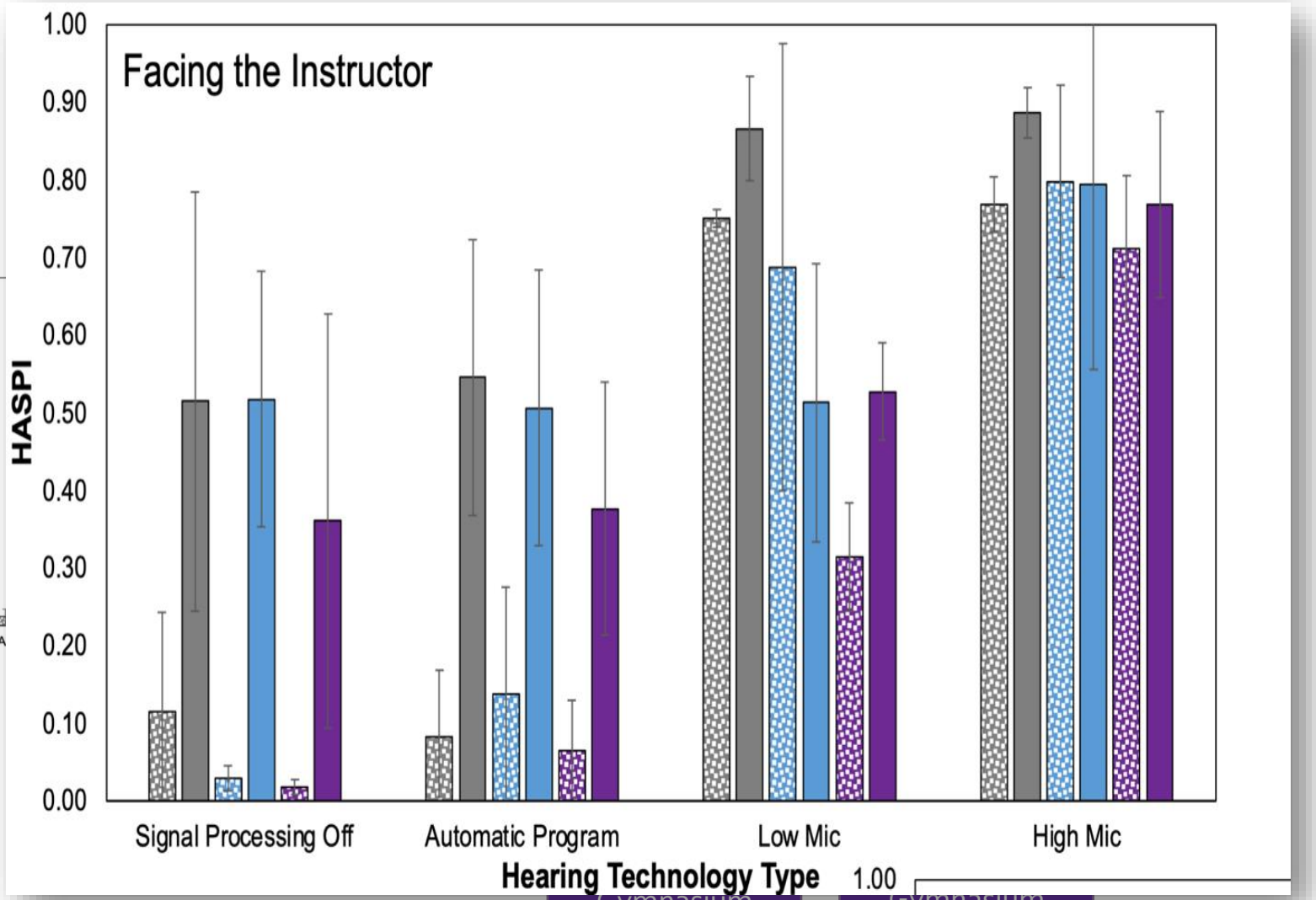


Rahme, M., Moir, G., Ashkanichenarlogh, V., Folkeard, P., Holden, M., Nugent, K., Wang, J. M., Parsa, V., & Scollie, S. (submitted). Remote Microphone Performance in Real-World Exercise Environments.









Gymnasium

Gymnasium

Dedicated hearing aid wireless mics make a big difference.

- You might get asked to wear one, even if you have a regular room mic.
- They send your voice directly into the hearing aid or cochlear implant.
- This removes the room echoes (mostly).

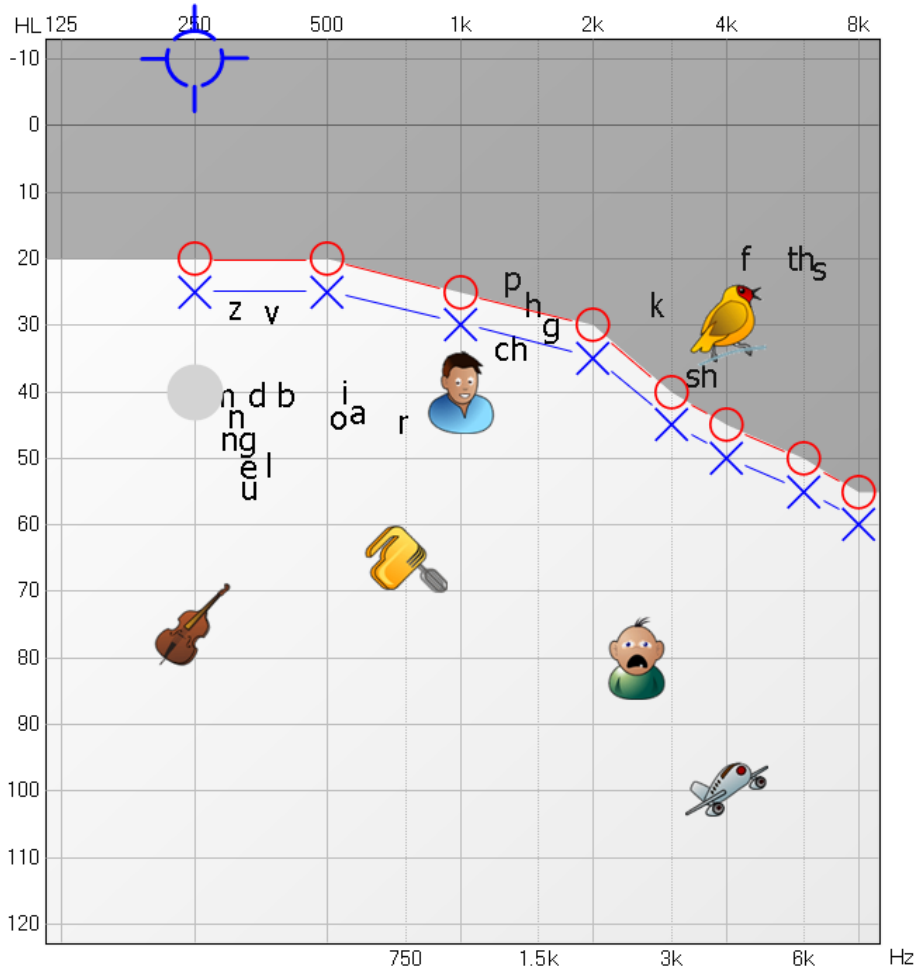
- These special mics have a big impact: From **10-20% to 70-80%** speech recognition, across brands, environments, and room locations.

Tips for Successful Communication at the Gym other than wearing that microphone.

- **Hearing Buddy (pair them up).**
- **Environment:**
  - Face the talker, speak louder, and reduce distance.
  - Good lighting and reduce/isolate background noise.
- **Speech/lip reading:**
  - Reduce head movement while you are talking.
  - Keep yourMouth/face visible (hand, hair, object).
- **The room itself:**
  - Soft surfaces absorb room echo.

Tips for Successful Communication at the Gym

- **High pitched sounds in speech are harder to hear but easier to see.**
- **High pitched sounds in speech are the consonants, not the vowels.**
- **High pitched sounds don’t travel through rooms as well, so room speakers or mic systems are really important.**



Tips for Successful Communication at the Gym

- **Make your instructions go even further.**
  - Catch their attention before giving instructions.
  - Face the room while giving instrucitions.
  - Slow down – pause between words.
  - Speak in short sentences.
  - If you are asked to repeat yourself: rephrase.
  - If you get a question from the floor: repeat it.
  - Demonstrate those moves: it’s visual information.
- **Turn down the music while you are giving instructions.**
- **Use the microphone and seek help when you need it.**

The Road to Barrier Free Canada

Health Canada (2022) launched the first Accessibility Plan under the Accessible Canada Act. to make Canada completely barrier free by 2040.

Thanks for your time today!

Download our research here.
Participate in our research here.