Noise and Music Induced Hearing Loss

How can you protect yourself?
How We Hear:

• Outer Ear- the most visible part
How We Hear: Outer Ear

The outermost part of the ear is called the pinna. The pinna acts like a funnel directing sound waves into the ear canal.

The sound waves then travel through the ear canal to the ear drum.

The sound waves vibrate the ear drum and the vibrations are transmitted to the middle ear.
How We Hear: Middle Ear

The middle ear is made up of the hammer, anvil, and stirrup bones.

These three bones are the smallest in the body and are collectively known as the ossicles.

The ossicles amplify and transfer the sound vibrations from the ear drum to the inner ear.
How We Hear: Inner Ear

The inner ear is made up of the semicircular canals and the cochlea.

Each part of the inner ear is very different in form and function to the human body.
Inner Ear: Semicircular Canals

The semicircular canals are the portion of the ear that helps detect movement and maintain balance.

The semicircular canals are filled with fluid, and as we move, it is that fluid that allows us to detect the movement and maintain our balance.
Inner Ear: The Cochlea

The cochlea houses the organ of Corti.

As sound vibrations move through the cochlea, they vibrate the microscopic hair cells found within the organ of Corti.

The vibrations of these hair cells trigger the electrical impulses sent to the brain from the auditory nerve, allowing us to hear.
Sensorineural Hearing Loss:

Is permanent and sometimes preventable.
Is the most common form of hearing loss.
Can affect people of all ages.
A high frequency hearing loss, of this type can indicate aging and/or noise exposure (Noise-Induced Hearing Loss).
Does not have any medical or surgical treatment options, in most cases.

Hearing aids are the primary treatment (an audiologist should be your primary healthcare provider for testing and fitting hearing aids).
A cochlear implant may be considered for patients with severe or profound cases of this form of hearing loss.
Sensorineural Hearing Loss

Sensorineural hearing loss occurs when the microscopic hair cells within the organ of Corti are damaged.

Once the hair cells are damaged, they do not regenerate.
Who is at higher risk of music-related hearing loss?

- Rock musicians
- Classical musicians
Who is at higher risk of music-related hearing loss?

- Rock musicians: 32%
- Classical musicians: 44-52%
Who is at greater risk of MIHL?

- Voice major
- Percussion major
- Brass major
- Woodwind major
- String major
- Keyboard major
Percentage of students with MIHL

![Bar chart showing percentage of students with MIHL for different instrument groups: voice, percussion, brass, wind, string, and keyboard. The highest percentage is for the string group, followed by the brass group.]
NIHL

**Definitions**

*Noise-induced hearing loss (NIHL)*
- Hearing loss caused by prolonged exposure to loud noise
- There is no cure for this type of hearing loss.

*Tinnitus*
- The perception of sound when no actual sound is present
- Referred to as "ringing in the ears"
- This is an early sign of hearing loss.
NIHL

• Noise-induced hearing loss is 100% preventable.
• Hearing loss among young adults is rising.
• Musicians are at even greater risk for hearing loss.
• Musicians may not be properly educated or equipped to prevent hearing loss.
Noise Induced Hearing Loss

- Initially, exposure to noise causes a loss of sensitivity to high frequency (high pitch) sound.
- Continued exposure results in damage to mid frequency region as well.
- One can experience progressive high frequency hearing loss and not be aware of it until it becomes severe.
How Can We Acquire Noise-Induced Hearing Loss?

- **ACOUSTIC TRAUMA** - ONE TIME EXPOSURE TO LOUD SOUND

  OR

- **DAILY EXPOSURES** TO MODERATELY LOUD SOUNDS
Symptoms/ Warning Signs of Hearing Loss

• Speech sounds distorted or muffled
• Difficulty understanding speech, especially with background noise
• Muffling of sounds after noise exposure
• Ringing or buzzing sounds in the ear
Symptoms/Warning Signs of Hearing Loss

• Difficulty hearing on the telephone
• Need for loud volume on TV or radio
• Frequently asking people to repeat themselves
• Difficulty hearing some pitches (usually high frequency)
When is Noise Defined to be a Hazard?

-85dBA for steady-state noise sources

-140dBp for impulse/impact noise sources
HOW DO WE KNOW SOMETHING IS TOO LOUD?

• Could use 3 foot rule
  – If you have to raise your voice to be heard by someone standing within 3 foot (arm’s length) then the level is most likely above the hazardous noise level
  or
  – Objectively measure loudness with proper equipment
Other Health Effects of Noise

The Effects of Noise are Similar to a Startle or Stress Response:

• Increased muscle tension
• Increased heart rate, blood pressure, and cholesterol
Why is Protecting My Hearing So Important?

• Hearing loss destroys your ability to hear and understand speech, especially in background noise

• Hearing loss is permanent and not medically treatable
Why is Protecting My Hearing So Important?

• Loss of hearing sensitivity due to hazardous noise exposures from either steady state noise or impulse noise does occur even before we can measure the change!
Characteristics of Sound

- Intensity, generally perceived as loudness, is measured in decibels (dB), on a logarithmic scale. This means that 90 dB is 10 times more intense than 80 db; 100 dB is 100 times more intense than 80 dB. The sound intensity doubles for every increase of 3 dB. Small increases in decibel level can involve a large increase in actual sound intensity.
Sound Pressure Levels

- Whisper 20 dB
- Conversation 60 dB
- Vacuum cleaner 80 dB
- Orchestral music 83-92 dB
- Subway 80-110 dB
- Rock music band 105-111 dB
- Discotheque 120 dB
- Jet takeoff (300 feet distance) 140 dB
How Can I Protect My Hearing?

• Reduce noise in the environment
• Wear well-fitted hearing protection
GOOD FIT

BAD FIT
How to Insert Foam Earplugs
Good Fit  vs.  Bad Fit

Proper

Improper
Musician Hearing Protection

• HPD’s designed specifically for musicians and sound engineers
• Medically fit and custom made for each individual
• NRR = 15-25dB
Musician’s Ear Plugs

• Marshall Chasin (hearing specialist in Canada) suggests 15 dB attenuating musician’s plugs for all around protection. Even if you currently have some hearing loss, you should still wear protection.
MIHL

• Musicians should use sound protection for practice and performance.
• Some studies have shown that 42% of tested musicians had greater hearing loss than expected for their ages.
• Sometimes cochlear damage results in changes in pitch perception.
iPods

• Headphones (especially noise cancelling headphones) are safer than earbuds.

• If you are at 80% volume, you should only listen for 90 minutes a day. Reduce the volume to 70%, and you can safely listen for 4 ½ hours a day.

• Listening to music at full volume can cause hearing loss with just 5 minutes of exposure a day.
0 dB (0 “decibels”)

20 decibels. Between 0 and 20 dB is normal for an adult

50 decibels

90 dB (90 decibels)

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Listening through HPDs takes practice....by wearing HPDs, you are protecting yourself against temporary threshold shifts which could lead to permanent hearing loss..by not protecting yourself, the shift in your hearing could be permanent!!!!
Conclusion

• Hearing loss is painless
• Hearing loss is not reversible
• The best type of hearing protection is the type that is worn correctly