Hearing Loss & Hearing Loss Prevention

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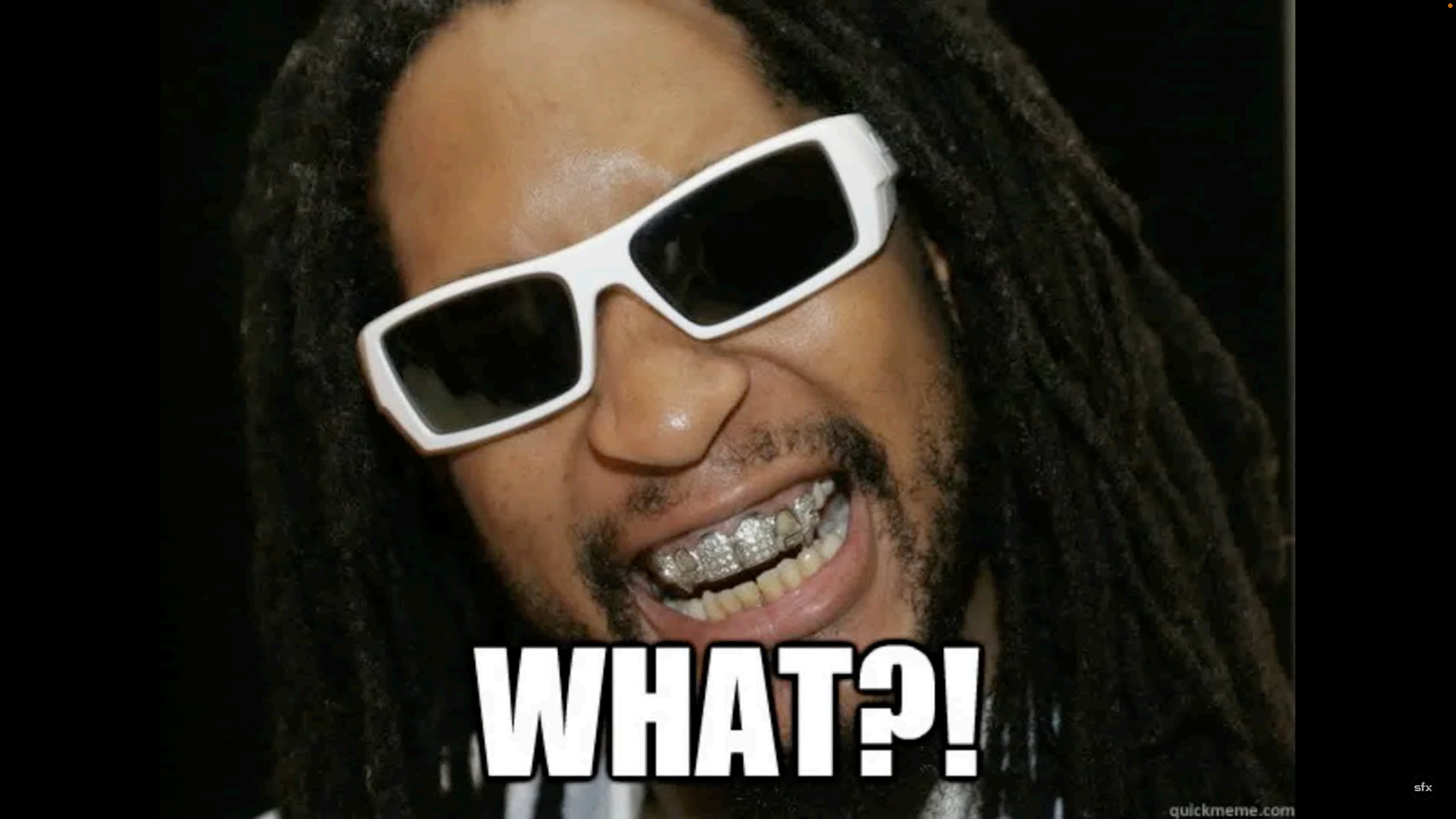
2022 National Conference on Percussion Pedagogy

“How To” Session


WHAT?!
quickmeme.com

Hearing Loss Articles

- http://www.brad-meyer.com/materaialsandresources/
  - “An Analysis of the Sound-Level Exposures of Drum and Bugle Corps Members During a Full-Day Rehearsal” ~Douglas Presley
  - “Hearing Conservation Programs for Drum and Bugle Corps: Implications for Educational Audiologists” ~Neumann, Bondurant, and Smaldino
  - “Protecting Your Hearing Health” ~NASM & PAMA
  - “Sound Exposure of Healthcare Professionals Working with a University Marching Band” ~Russell and Yamaguchi
  - “Marching Band - a threat to hearing?” ~USA Today
  - “University Marching Band Members’ Noise Dosages and Hearing Health” - Russell, Bhatt, Meier, Chuzie, Nadeau, Kirjava, and Goff

The Need To Protect Everyone ASAP!

- NoiSEE 

- NIOSH 
- Sound Meter 

- Decibel 

- Noise Hunter

Time to reach 100% noise dose	Exposure level per NIOSH REL	Exposure level per OSHA PEL
8 hours	85 dBA	90 dBA
4 hours	88 dBA	95 dBA
2 hours	91 dBA	100 dBA
1 hour	94 dBA	105 dBA
30 minutes	97 dBA	110 dBA
15 minutes	100 dBA	115 dBA

The Need To Protect Everyone ASAP!

MARCHING PERCUSSION EXAMPLES

- From a 12 hour Drum Corps rehearsal day
- If you convert to a 3 hour rehearsal, you still are over your exposure by:

Snare: 20x
Tenor: 10x
Bass: 8x
Percussion (Rack): 3x
Vibe: 3.5x
Marimba: 3x
Timpani: 3x

Table 12
Instrument, Number of Subjects per Instrument (n), and Average Dose Percentage Based on a 12-hour Day (Average Dose Percentage), and Range

Instrument	*n*	Average Dose Percentage	Range
Trumpet	4	846.59%	502.71
Mellophone	4	661.70%	225.70
Euphonium	2	383.62%	30.79
Baritone	2	1142.58%	493.68
Contra	4	574.54%	153.36
Snare Drum	4	8188.17%	4135.57
Tenor Drum	2	4180.89%	482.46
Bass Drum	2	3121.59%	3457.41
Percussion	2	1212.57%	0
Vibraphone	3	1549.91%	1583.86
Marimba	1	1157.82%	0
Timpani	1	1105.53%	0
Drum Major	1	348.22%	0

AN ANALYSIS OF THE SOUND-LEVEL EXPOSURES OF DRUM AND BUGLE CORPS MEMBERS DURING A FULL-DAY REHEARSAL
Presley

What You Can Do NOW!

Screening for hearing loss

Recommendations for Audiologic Evaluation (tip: 14 hours of rest helps to reduce temporary threshold shift)

Hearing test are covered with physician referral and there is a private pay price as well.

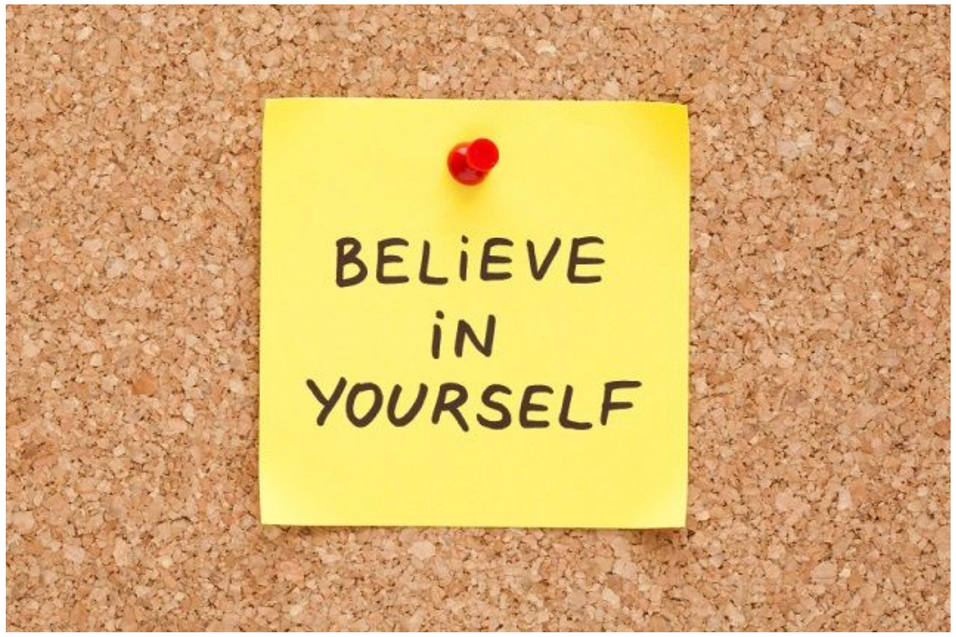
Follow up see how fitting going (REAL-Ear, serial hearing test)

What We Will Discuss

- Difficulties -> Solutions
- Types of Hearing Protection
- Statistics about sound exposure
- Tinnitus, Hyperacusis, and Diplacusis
- Cerumen Removal
- What can we as Teachers do to help
- Process of getting custom-molded earplugs
- Open Discussion

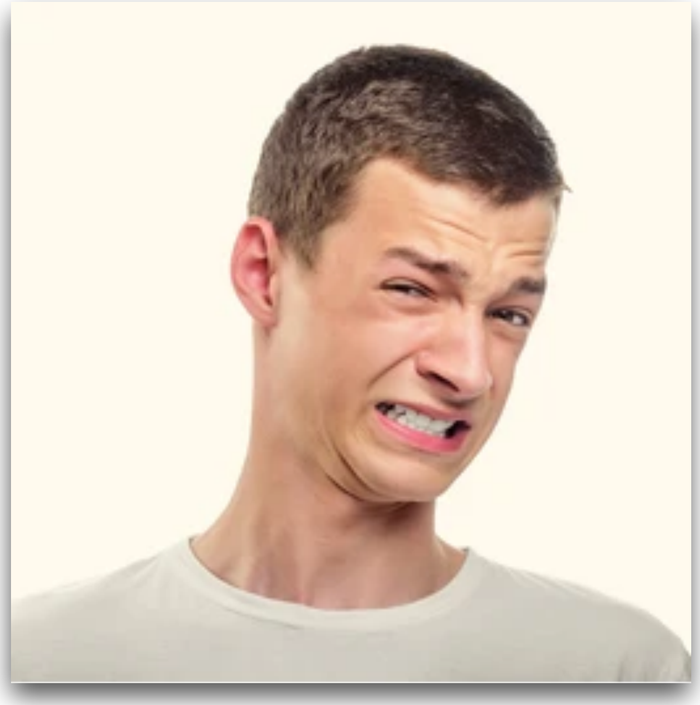
Difficulties -> Solutions

- TOO OLD or TOO MUCH LOSS ALREADY
    - Many musicians don’t use hearing protection because they believe they have lost too much already or they believe their hearing is “too far gone” to help. NOT TRUE! It’s never too late to start protecting your hearing.
    - Be a model for your students/peers.
    - Create a habit of wearing earplugs:
        - Have them EVERYWHERE!
          ex: car, office, gig bag, backpack, etc.



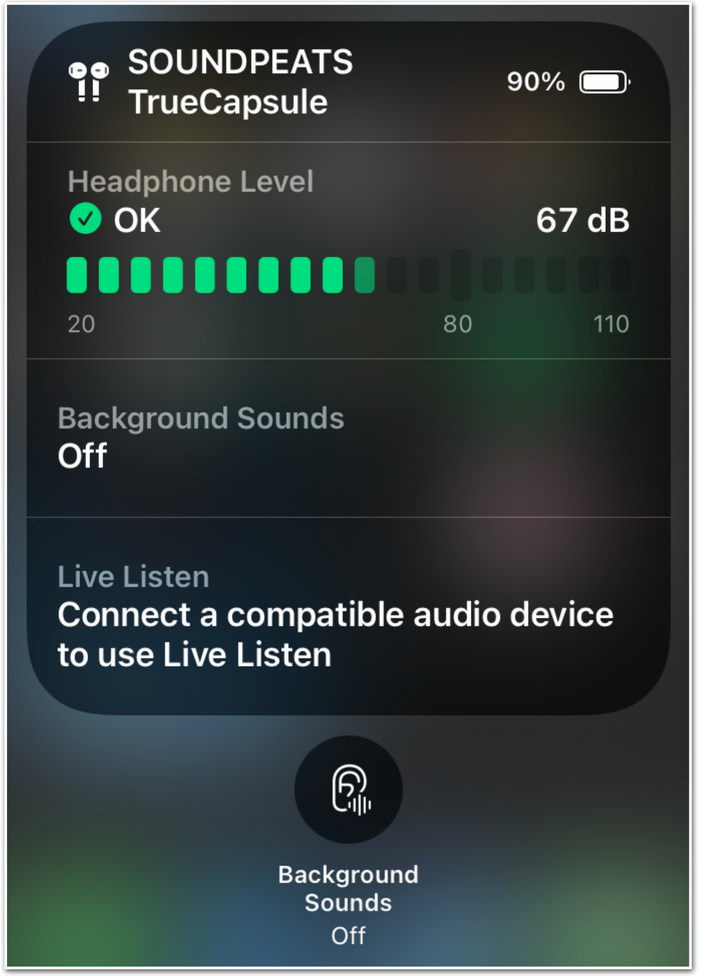
Difficulties -> Solutions

- MUSIC DOESN’T SOUND THE SAME:
    - Many musicians don’t use hearing protection because they dislike how music sounds when using earplugs.
    - IT’S SUPPOSED TO SOUND DIFFERENT! You get used to it very quickly and may even prefer it after a while.
    - Plus, many say that music sounds better because there’s less/no distortion. Also, there are different levels of attenuation to let you reduce to your level of comfort.



Difficulties -> Solutions

- PLAYING/PERFORMING MUSIC ISN’T THE ONLY TIME YOU’RE HURTING YOUR HEARING
    - Many people do daily activities that damage hearing:
        - Mowing
        - Driving/Flying (especially w/ music)
        - Working out (w/ music)
        - TV/Movies
        - Concerts
        - Dining/Bars



Types of Hearing Protection

- “Foamies”
    - Cheap ($1-2)
    - Easy to put them everywhere
    - Universal fit
    - Sound bad (block out more high’s than low’s)
    - A lot of reduction (usually meant for firing guns)
    - Ugly and very noticeable

Types of Hearing Protection

- “Musicians’ Plugs” (Etymotic, Earasers, etc.)
    - Inexpensive ($10-20)
    - Easy to have a few sets everywhere
    - Several size options
    - Good sound quality (more even attenuation)
    - Slightly noticeable
    - Trouble with getting consistent fit.

Types of Hearing Protection

- Molded Earplugs
    - Expensive ($120-250)
    - Usually only one set ->
        - Can’t lose them, and no extras around
    - Perfect fit
    - Fantastic sound quality (extremely even attenuation)
    - Slightly noticeable
    - Different levels of attenuation (filters: 9 db, 15 db, 25 db)

Types of Hearing Protection

- Over-Ear Headphones
    - About $90
    - Great for isolation
    - Usually can play music through them
    - Not great for hearing yourself
    - Different companies headphones have widely varying levels of attenuation
    - Bulky, can be uncomfortable

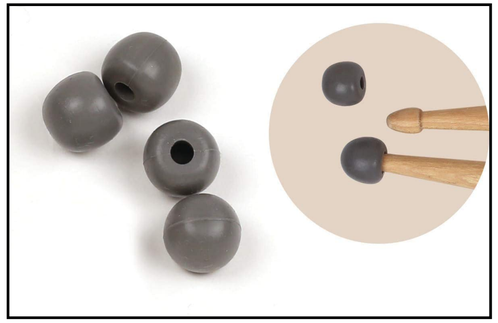
DO NOT USE NOISE CANCELING HEADPHONES OR OTHER "REGULAR" HEADPHONES

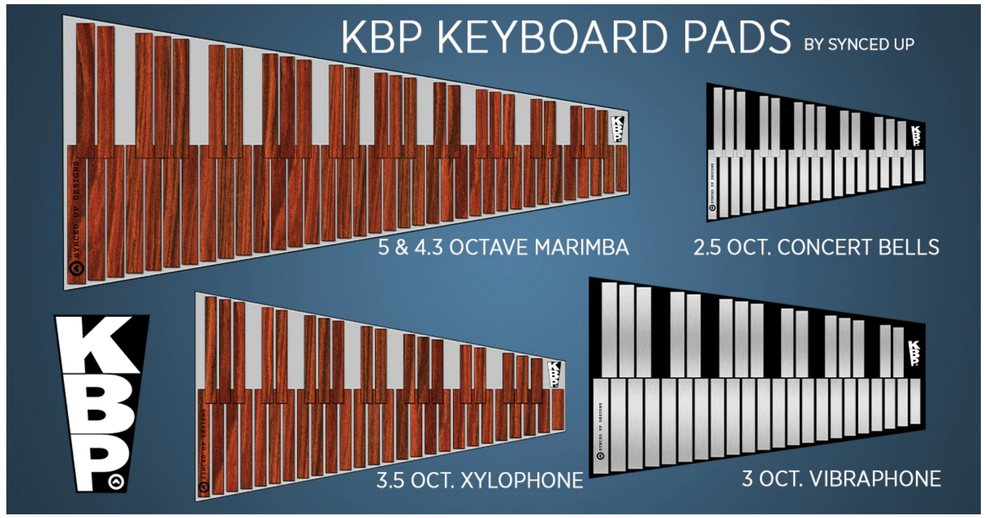
- While these claim to reduce levels, they are not certified for nor tested under the same conditions
- Most users listen to music 15db higher than their environment
- Outside level - Amount of reduction + 15db will almost always be higher than the recommended 85dBA

Headphone	Style	Noise Reduction Method (active or passive)	Amount of Reduction	Experience at 15 dB over background	Experience at 30 dB over background
Apple AirPods Pro	In-ear	Active noise cancelling	23 dB	87 dB	102 dB
Apple AirPods Max	Over-ear	Active noise cancelling	26 dB	84 dB	99 dB
Sony 1000XM3	Over-ear	Active noise cancelling	30 dB	80 dB	95 dB
Sony 1000XM4	Over-ear	Active noise cancelling	29 dB	81 dB	96 dB
Bose QuetComfort 35	Over-ear	Active noise cancelling	27 dB	83 dB	98 dB
Bose QuietComfort Buds	In-ear	Active noise cancelling	22 dB	88 dB	103 dB
Beats Solo Pro	Over-ear	Active noise cancelling	23 dB	87 dB	102 dB
Beats Studio 3	Over-ear	Active noise cancelling	22 dB	88 dB	103 dB
Beats Solo 2	Over-ear	Passive (blocking)	13 dB	97 dB	112 dB
Beats Flex Wireless	In-ear	Passive (blocking)	21 dB	89 dB	104 dB

Low-Volume Solutions

- Mesh Heads
- Low-Volume Cymbals
- Practice Pads
- Remove Resonators
- Pillow-Stuff Drums
- Sponge Mallets & Rubber-Tipped Sticks
- Keyboard “Practice Banners”





EXPOSURE TIME FOR A 12 MINUTE DCI PERFORMANCE

- NIOSH recommends no more than 15 minutes at 100dBA, and 7.5 minute at 103 dBA
- The average of the percussion section exceeds its DAILY exposure dose in less than ONE run through of the show!

Table 15

Instrument, Number of Subjects, Average Sound Level (L_{eq}), and Standard Deviation During Program Performance

Instrument	Number of Subjects	L_{eq}	Standard Deviation
Trumpet	3	99.3 dBA	0.89
Mellophone	4	98.2 dBA	0.75
Euphonium	1	99.3 dBA	0.00
Baritone	2	98.9 dBA	1.62
Contra	4	96.4 dBA	0.72
Brass Average		*98.1 dBA*	*1.56*
Snare Drum	3	107.0 dBA	1.16
Tenor Drum	2	103.8 dBA	0.56
Bass Drum	2	101.1 dBA	4.45
Percussion	2	103.0 dBA	0.98
Vibraphone	3	104.0 dBA	2.65
Marimba	1	101.2 dBA	0.00
Timpani	1	101.0 dBA	0.00
Percussion Average		*103.6 dBA*	*2.75*
Drum Major	1	94.2 dBA	0.00
Average for All		*100.6 dBA*	*3.71*

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ORCHESTRAL INSTRUMENT EXAMPLES

- High frequency sounds from 2khz-4khz are the most damage
- The highest octave of a piccolo is ~2khz-4khz
- One THIRD of the total power of a 75 piece orchestra is from the bass drum

Sound Levels of Music	
Normal piano practice	60 -70dB
Fortissimo Singer, 3'	70dB
Chamber music, small auditorium	75 - 85dB
Piano Fortissimo	84 - 103dB
Violin	82 - 92dB
Cello	85 -111dB
Oboe	95-112dB
Flute	92 -103dB
Piccolo	90 -106dB
Clarinet	85 - 114dB
French horn	90 - 106dB
Trombone	85 - 114dB
Tympani & bass drum	106dB
Walkman on 5/10	94dB
Symphonic music peak	120 - 137dB
Amplifier, rock, 4-6'	120dB
Rock music peak	150dB

Musicians and the Prevention of Hearing Loss
Marshall Chasin M.Sc., Aud (C), FAAA

ORCHESTRAL PERCUSSION SPECIFIC EXAMPLES

- Study done in practice rooms with students working on excerpts
- All instruments besides orchestra bells have an exposure time of less than 1 hour per day

No.	Musical instrument	L_{peak} (dB)	L_1 (dB)	L_{eq} (dB)
1	Orchestral bells	119.5	99.0	87.4
2	Tubular bells "Premier"	118.2	109.0	99.4
3	Kettledrum "Ludwig"	125.0	117.2	107.5
4	Xylophone "Musser Kelon 51"(*)	126.2	108.4	97.3
5	Xylophone "Musser Kelon 51"(**)	126.0	107.7	96.8
6	Marimba "One" Ron Samuels	117.8	113.9	105.6
7	Cymbals A-Due	136.7	119.5	106.3
8	Snare drum "Yamaha" (snare off)	130.8	120.8	110.2
9	Snare drum "Yamaha" (snare on)	127.5	117.9	106.5
10	Drums	132.8	124.3	114.8

(*) — plastic sticks; (**) — wooden sticks; CF — crest factor.

SOUND PRESSURE LEVELS IN EMISSION OF PERCUSSION INSTRUMENTS DURING TRAINING SESSIONS
A. JAROSZEWSKI. P. ROGOWSKI and A. RAKOWSKI

INDOOR MARCHING PERCUSSION

- Measurements done 10ft-20ft in front of performer
- Even in the most generous circumstances, max time of exposure is only 2 hours

Table 2: Condition Averages by Group

Averages	Group #1	Group #2	Group #3	Group #4
Snares	93.48 dBA	92.97 dBA	90.73 dBA	92.90 dBA
Battery	98.08 dBA	91.91 dBA	92.67 dBA	94.71 dBA
Full	90.95 dBA	95.06 dBA	92.48 dBA	94.39 dBA

Noise Exposure in Indoor Marching Percussion Ensembles

Schueller

Other Concerns

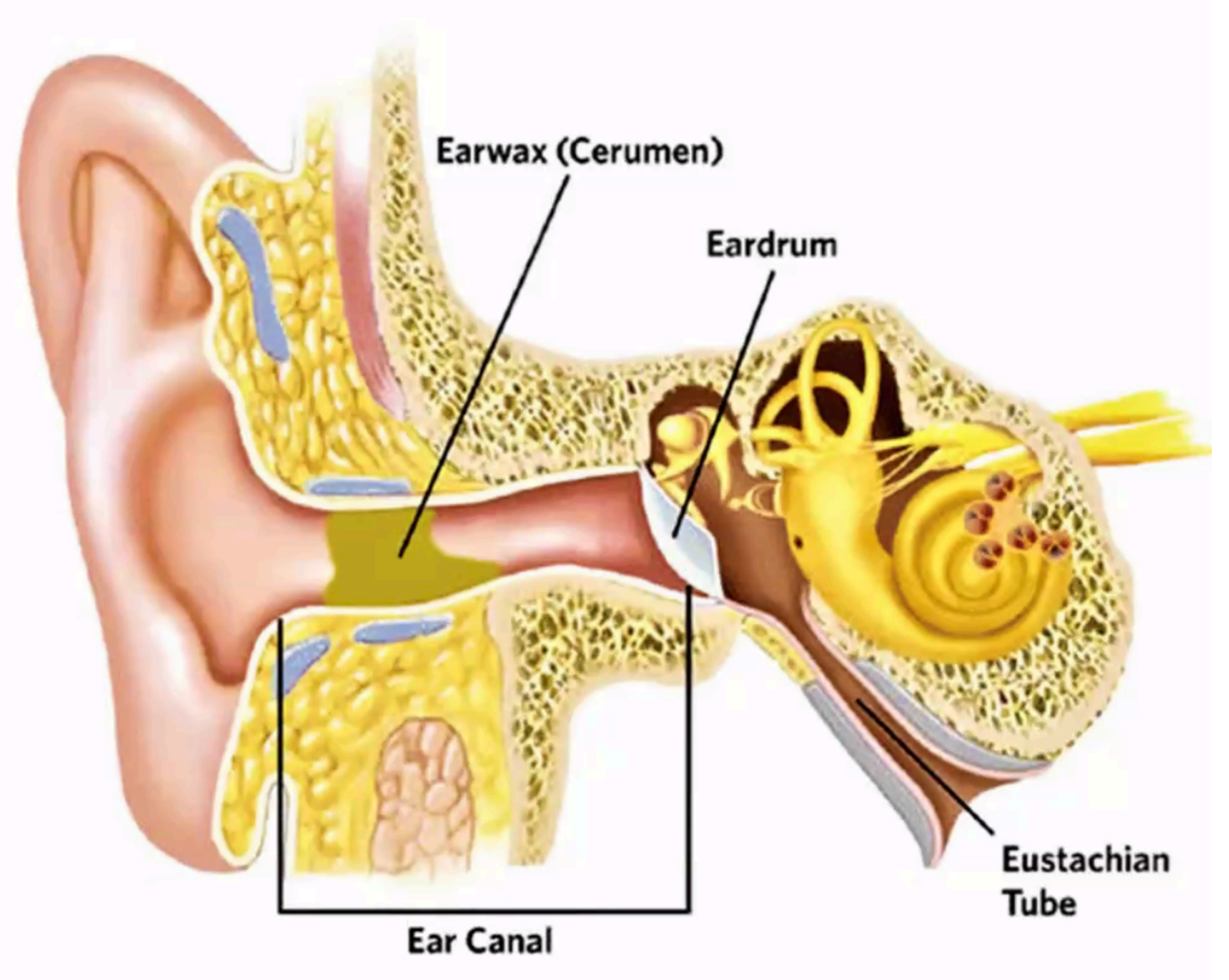
- Any changes in hearing
- Tinnitus
- Hyperacusis
- Dizziness
- Instrumentation
- Practice schedule
- Family history of hearing loss
- Family history of Tinnitus
- Medications (Ototocix [ie: ear-damaging side effects] medications)
- Co-Morbidities (diabetes, autoimmune issues, multiple sclerosis, history of cancer)

Tinnitus, Hyperacusis, and Diplacusis

- Tinnitus: the perception of sound without an external auditory stimulus
- Inquire if it is Pulsatile Tinnitus or Non-Pulsatile Tinnitus.
    - Non-Pulsatile Tinnitus: Otoscope, Audiological Evaluation/Tinnitus Matching, Tinnitus Handicap Inventory, Family history of Tinnitus, Inventor of medications relying out ototoxic medication (Aspirin regimen, caffeine intake, methotrexate, Quinine, Furosemide, Lassie, or Diuretic
- Tinnitus Retraining Therapy/Cognitive Behavioral Therapy
- Counseling Strategies: avoid excessive quiet, excessive noise, wear amplification hearing devices, appropriate hearing protection, reducing stressors.
- Hyperacusis: sound/noise sensitivity (1 in 50,000 people)
- Diplacusis (“double hearing”): hearing loss causing each ear to hear the same sound differently.

Cerumen Removal

- Cerumen (“wax”) Removal:
    - Blake et al. reports that wax accounts for 12 million visits to the physician every year.
    - Cerumen removal is completed over 8 million times a year in the US.
    - Incorrect removal of wax can lead to hearing loss, perforation of tympanic membrane, subsequent surgery to fix problems, and Tinnitus. (Water/ irrigation removal of wax = bad)



Cerumen Removal

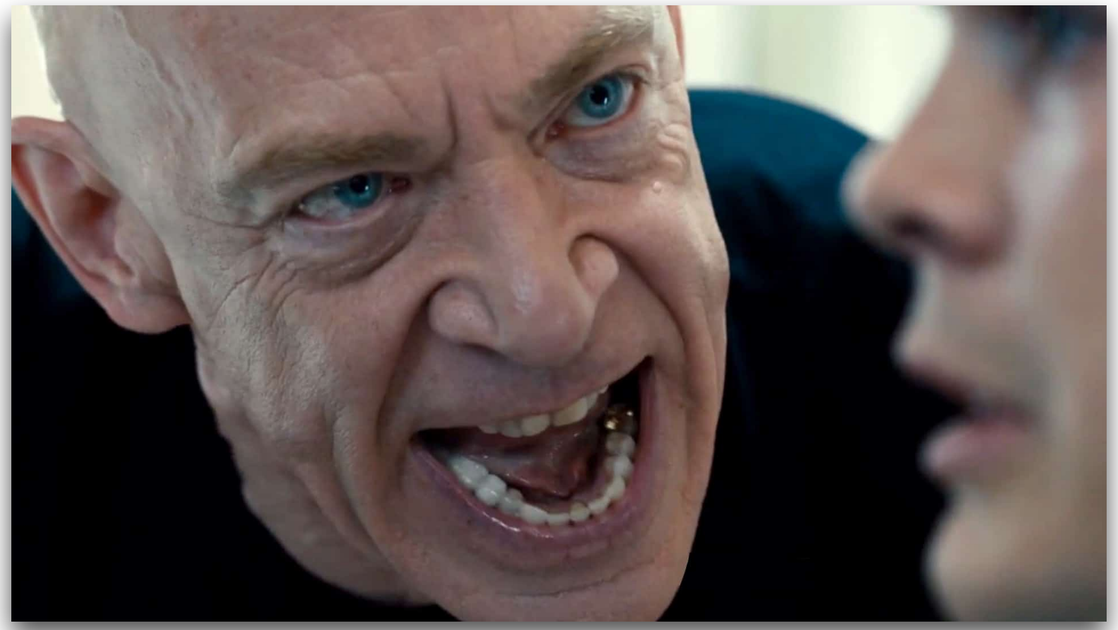
- Audiologist are skilled at removed uncomplicated cerumen: informed consent, instrumentation, irrigation/lavage, test ears afterwards.
- Benefits:
    - Accessible (get an appointment quickly)
    - Triage the ear: refer patient on to a higher level of care with an Ear, Nose, and Throat Doctor (ENT) if you have contra indications, i.e. perforation of the eardrum, drainage, trauma to the ear, or Diabetic
- If you see an Otolaryngologist/ENT doctor, they will refer you to an Audiologist to test you after cerumen removal, if you require a higher level of care.

What Can We Do As Teacher To Help

- Be a role model:
    - Wear earplugs while teaching lesson, running rehearsals, practicing, performer, etc.
    - I leave mine in during the whole day: allows my hearing to stay adjusted and students see me at all times wearing them

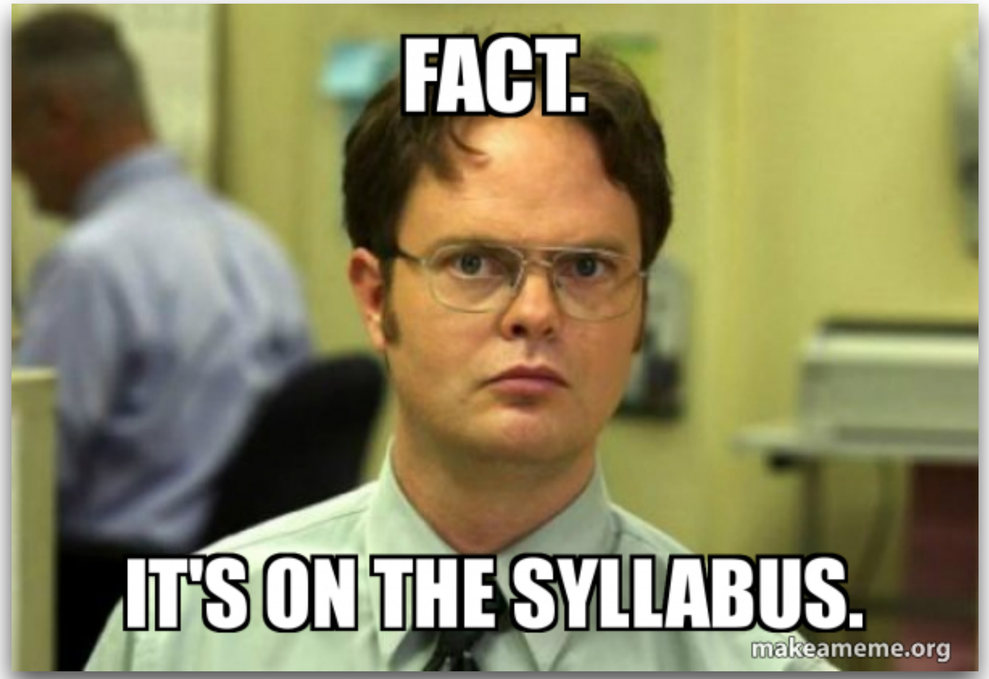
What Can We Do As Teacher To Help

- Educate them:
    - Start every school year with a reminder about wearing hearing protection. Bring in a clinician (virtual/in-person) to discuss hearing protection. Also, there are many great YouTube videos with interviews, helpful info, etc.
    - Tell them where they can go to purchase earplugs (many universities have an audiology department)



What Can We Do As Teacher To Help

- Mandate it (if possible):
    - Work with your marching band directors to provide free/reduced-cost earplugs. (Etymotic/Vic Firth did for our marching band)
    - Make it a part of the syllabus -> start rehearsal off by checking they have their earplugs before playing.
    - Use funding to purchase a bulk of cheap earplugs and have them available in your student for free.
    - Encourage it in lesson teaching.



What Can We Do As Teacher To Help

- Stop stigmatizing hearing protection:
    - “I only wear earplugs during practice.”
    - “Take out your earplugs; you’re not able to play in-time/listen well enough/hear the nuances with them in.”
    - “I would wear earplugs, but my hearing is already too far gone.”
    - “I’m just not used to wearing them.”
    - “No one ever made me wear them, so now I just can’t develop the habit.”
    - “I always forget them.”

Getting Molded Earplugs

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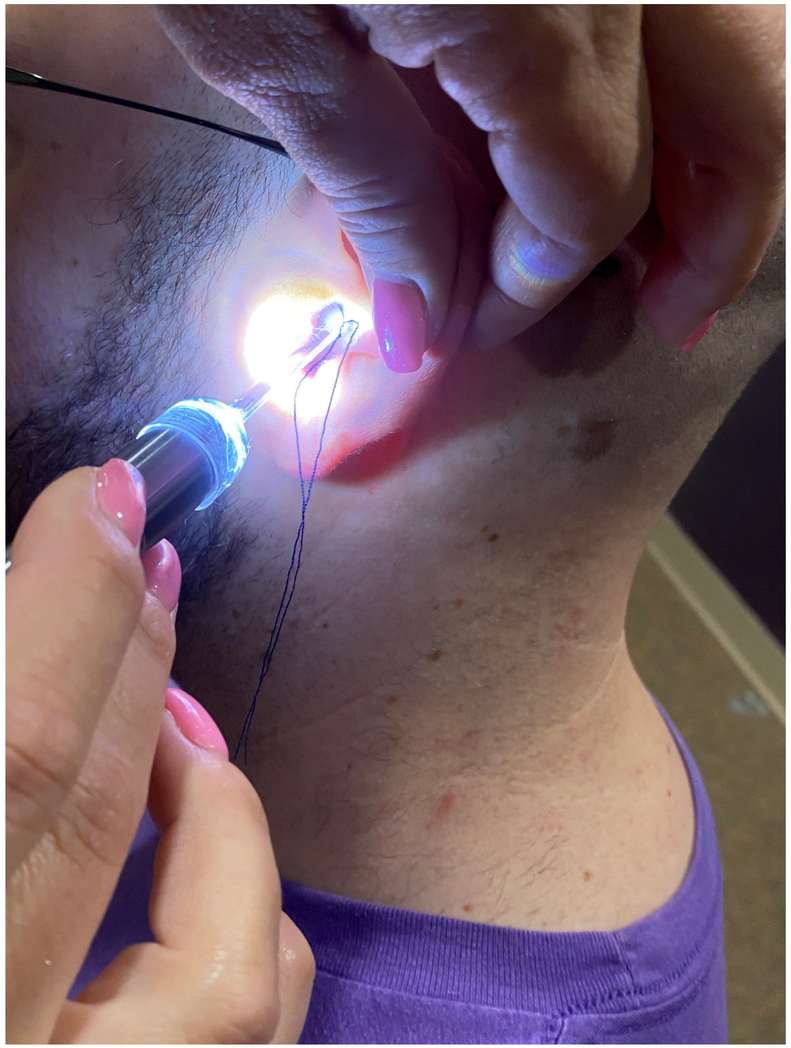

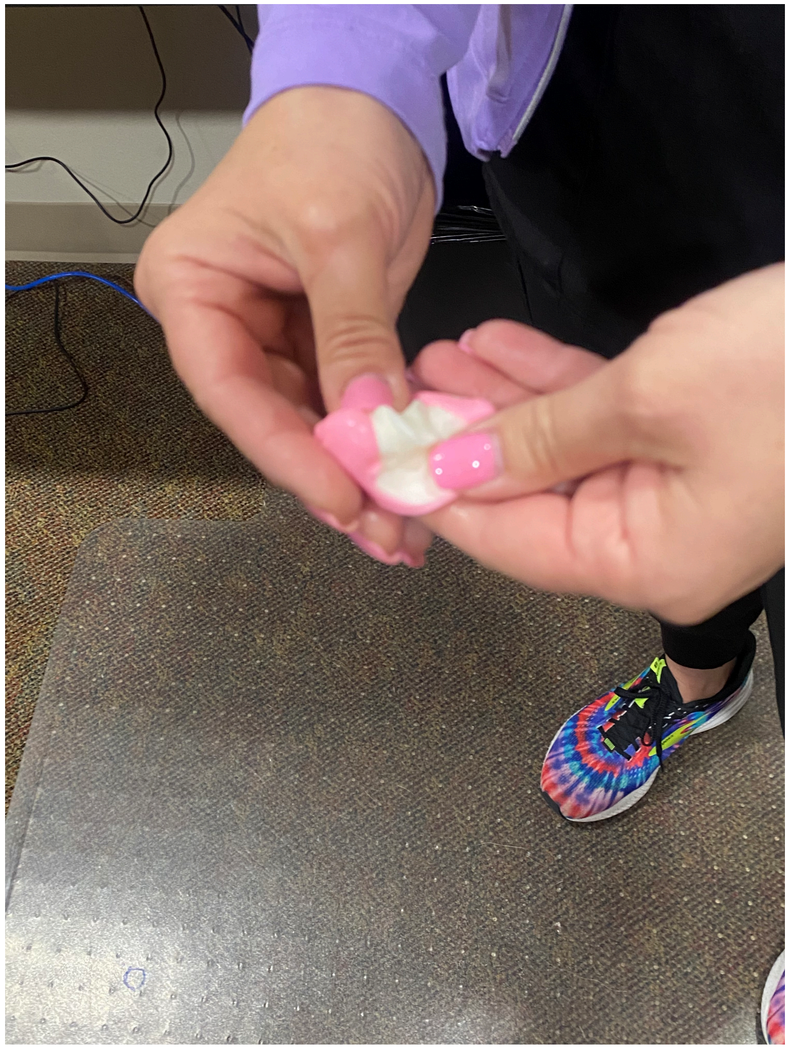

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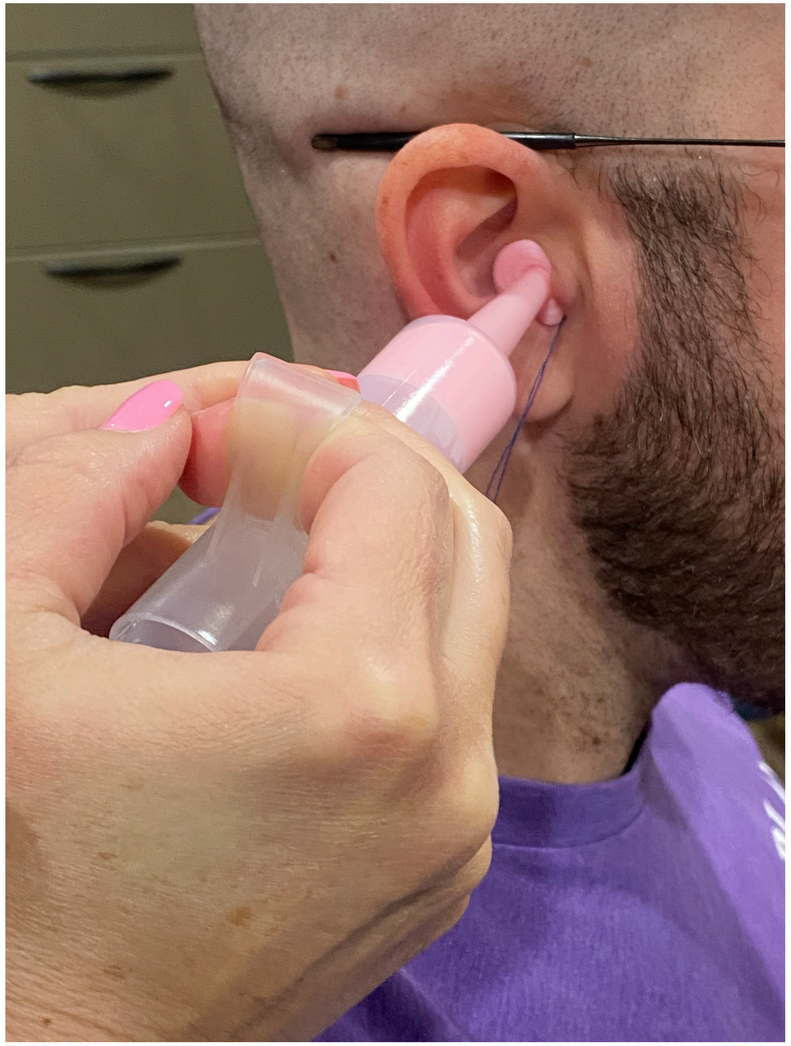

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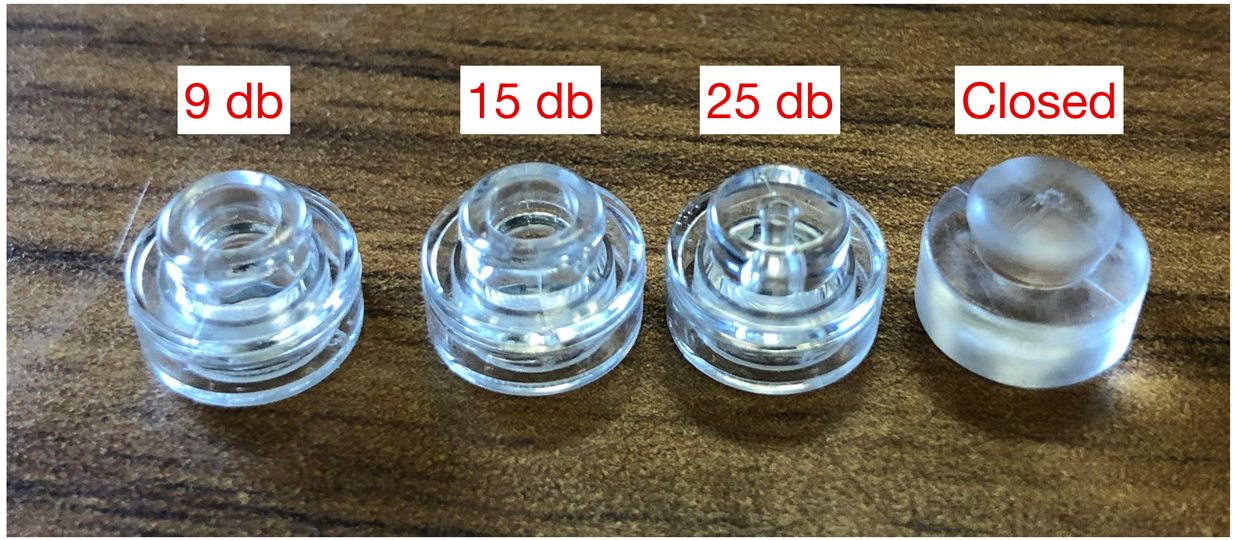

What Else Can We Do?

Hearing Health Articles

- How to increase earplug usage?
    - Students
    - Teachers
    - Professionals
    - Non-musicians
- How to increase hearing-health awareness?
- Are there any other hearing related issues than what was covered?