Noise Levels

Instructions: Match the noise with the category below.

traffic
snowmobile
leaves rustling
lawn mower
dishwasher
custom car stereo at full volume
vacuum cleaner
jackhammer
gun shot
hair dryer
fireworks
sporting event
whisper
jet plane takeoff
ambulance
quiet library
power tool
normal conversation
car horn
moderate rainfall
blender
live concert
MP3 player at full volume
alarm clock

OVER 85 DB FOR EXTENDED PERIODS CAN CAUSE PERMANENT HEARING LOSS.

DANGEROUS OVER 30 MINUTES | DANGEROUS OVER 30 SECONDS | USE HEARING PROTECTION/AVOID

FAINT	SOFT	MODERATE	LOUD	VERY LOUD	UNCOMFORTABLE	PAINFUL & DANGEROUS
20–30 dB	30–50 dB	50–70 dB	70–90 dB	90–120 dB	120–130 dB	130+ dB

Protect your ears. If the noise is too loud, walk away, turn it down (*Turn it to the Left*), or use ear plugs.

AMERICAN ACADEMY OF AUDIOLOGY
www.audiology.org

turn it to the left®
www.TurnItToTheLeft.com

Noise Levels

Instructions: Match the noise with the category below. **ANSWER KEY**

OVER 85 DB FOR EXTENDED PERIODS CAN CAUSE PERMANENT HEARING LOSS.

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				DANGEROUS OVER 30 MINUTES	DANGEROUS OVER 30 SECONDS	USE HEARING PROTECTION/AVOID
leaves rustling	whisper quiet library	normal conversation dishwasher moderate rainfall	traffic vacuum cleaner alarm clock	live concert car horn sporting event snowmobile MP3 player at full volume power tool lawn mower hair dryer blender	jet plane takeoff	fireworks gun shot custom car stereo at full volume ambulance jackhammer

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Hearing Loss and Communication for Musicians

Hearing loss doesn't just "happen to old folks"

- 3 in every 10 people over age 60 have a hearing loss
- 1 in every 6 baby boomers (ages 41-59) has a hearing loss
- 1 in every 14 Generation X'ers (29-40) already has a hearing loss
- An estimated 1.5 *million* youth, under the age of 21, have at least a mild hearing loss

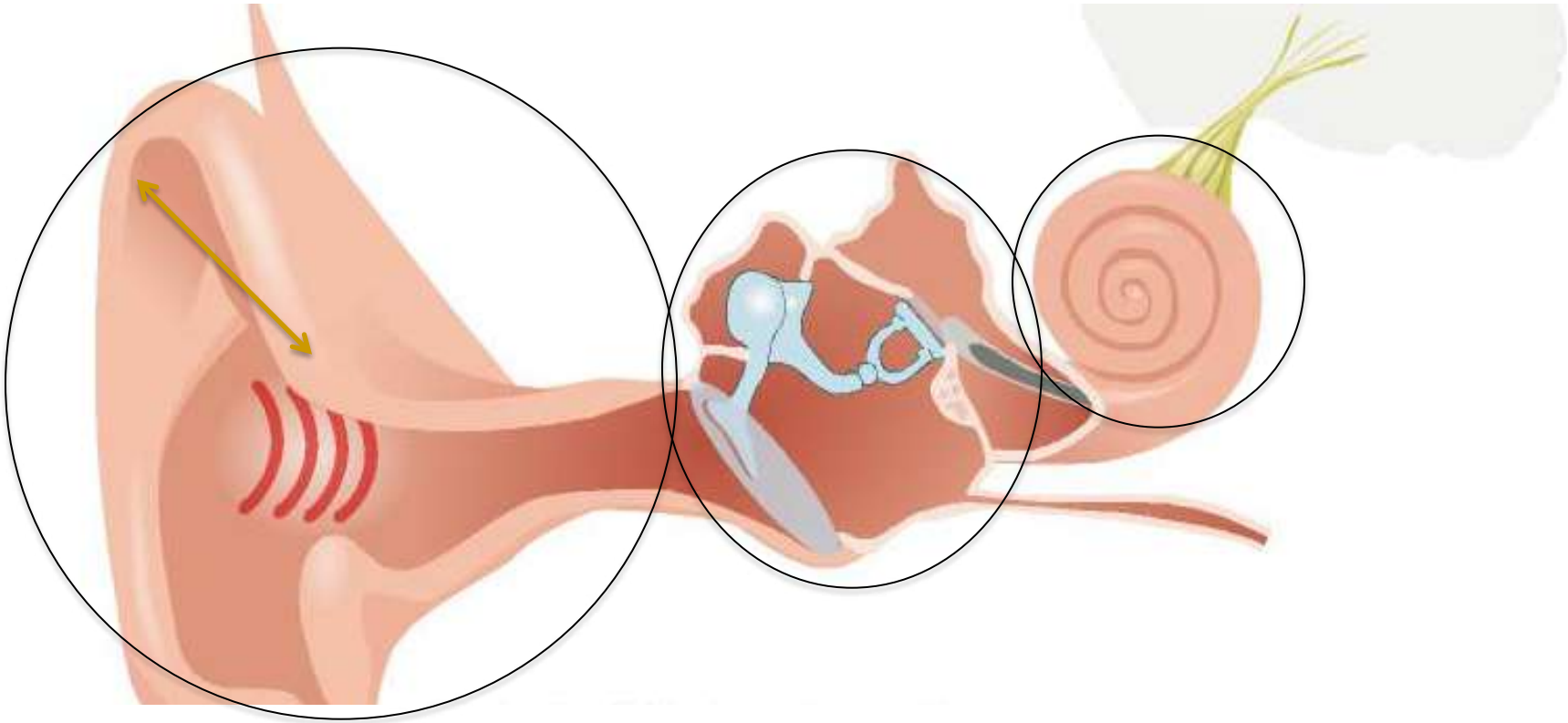
Audiologist's Role

- Professionals who help people with hearing problems by providing innovative solutions using both medical science and technology
- Audiologists specialize in the following:
  - Normal and impaired hearing
  - Identification of hearing and balance problems
  - **Prevention** of hearing loss
  - Hearing Conservation and Protection
  - Rehabilitation
  - Dispensing of assistive technology systems

What does this have to do with me?

- Music Induced Hearing Loss (MIHL)
  - A gradual hearing loss due to chronic exposure to loud music
  - The only way to prevent noise induced hearing loss is to protect your hearing or keep the volume down.

The pathway of sound

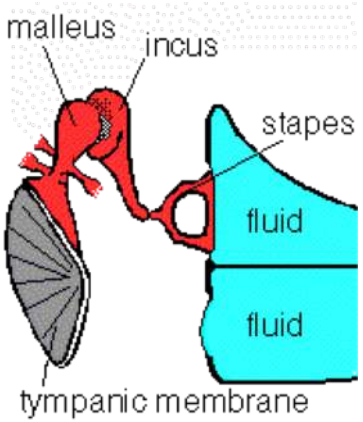


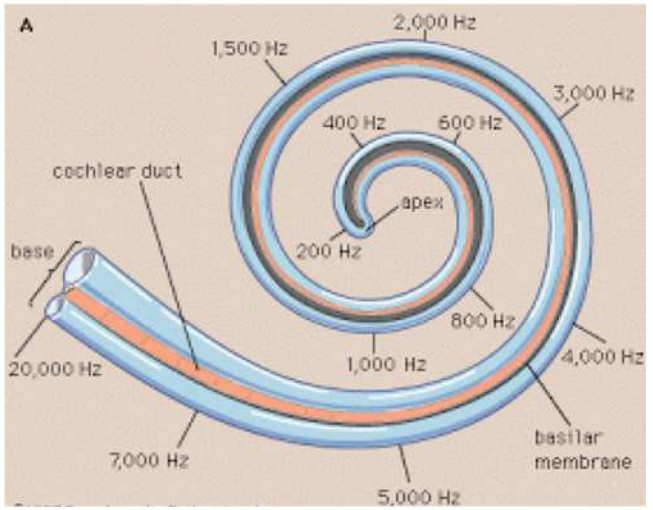
OUTER EAR

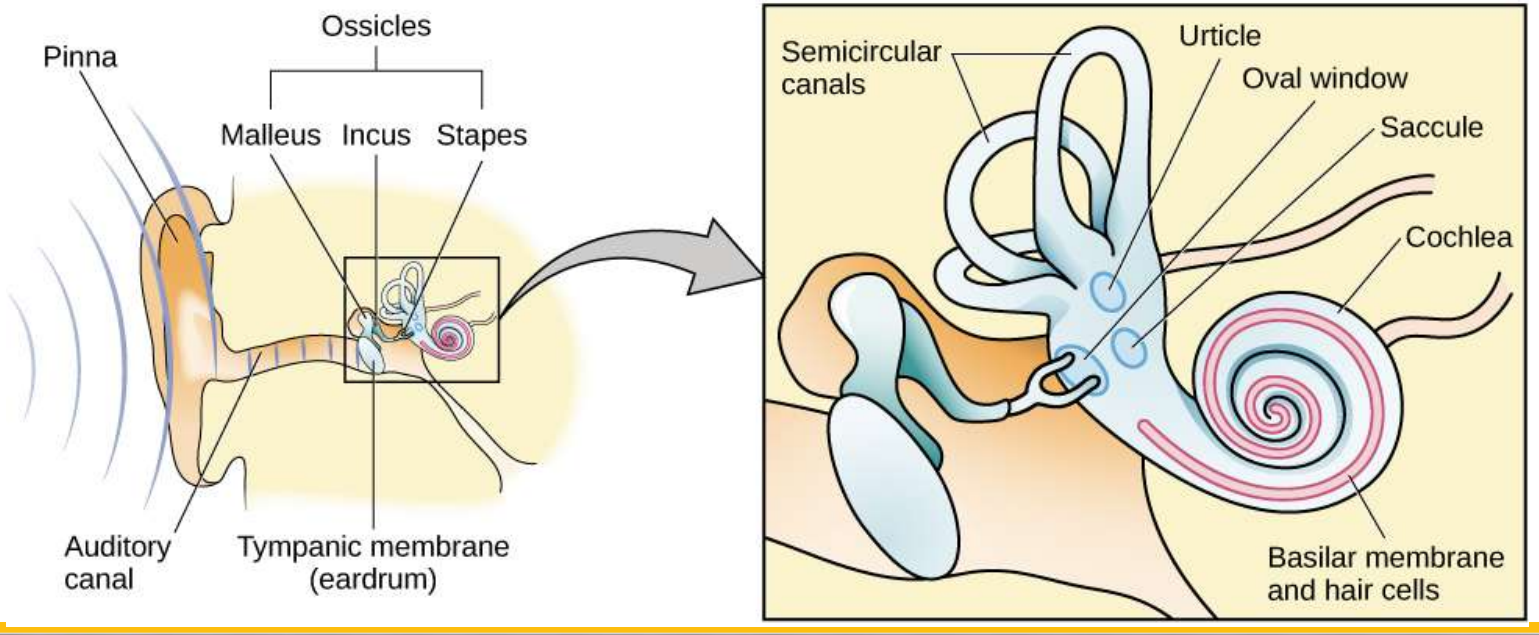
MIDDLE EAR

INNER EAR

High frequencies are affected most

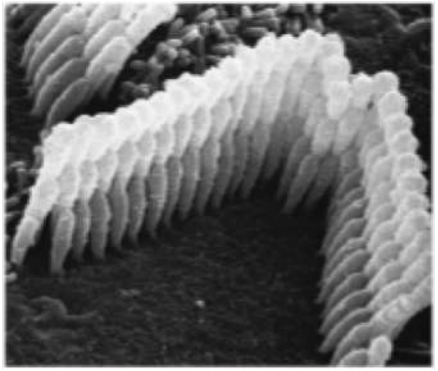


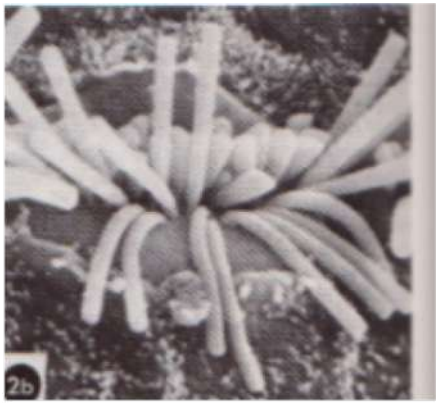




MIHL (Music-Induced Hearing Loss)

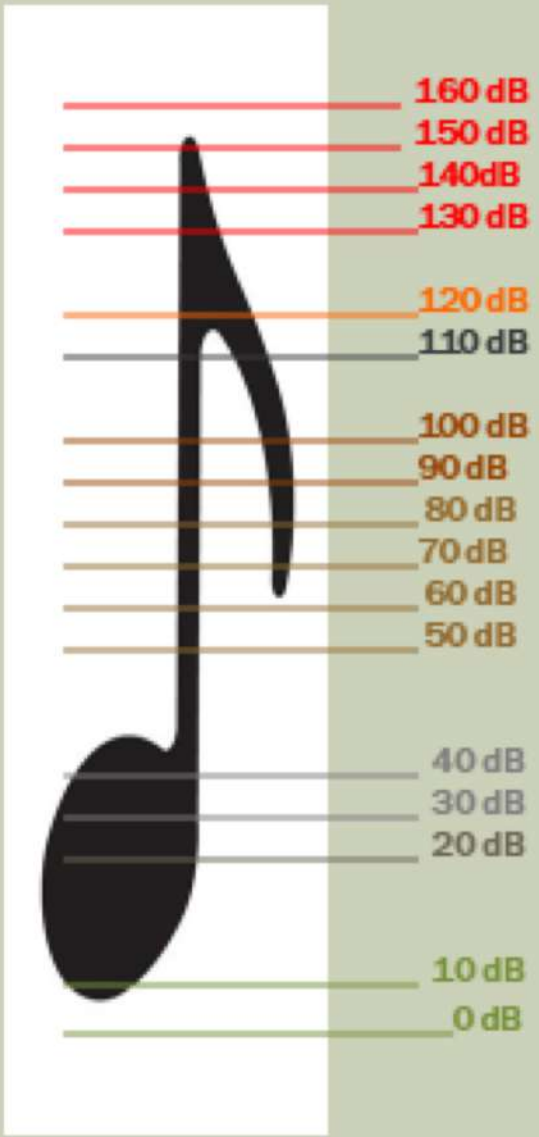
Hearing loss as a result of prolonged or sudden exposure to loud Music





- When our ears are exposed to levels of noise over 85 dB, the tiny hair cells in our cochlea can become damaged from the vibrations.
- Once the hair cells break, they will NEVER grow back, this causes hearing loss.

Noise Doses



Live Rock Band

High Hat Symbol Strike

Full Symphony Orchestra

Fortissimo Singer @ 1 m

Loud Radio/Avg. Stereo

Normal Piano Practice

Soft mp3 player in home

Background studio TV

Quiet Office

Rustle of Leaves

Intolerable

Pain

Very Noisy

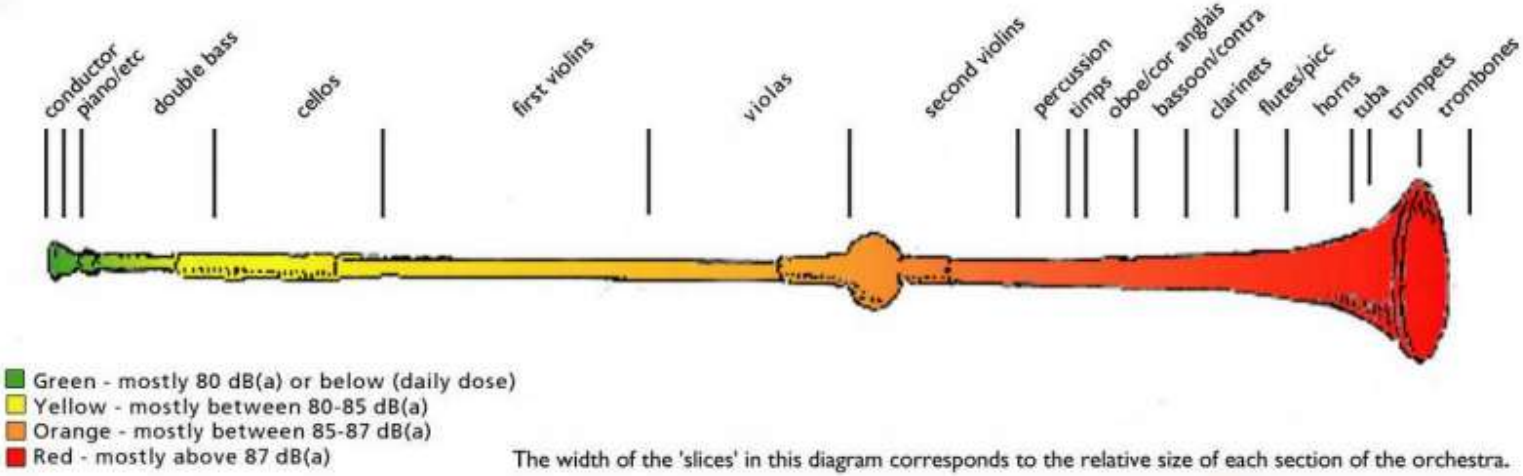
Loud

Moderate

Faint

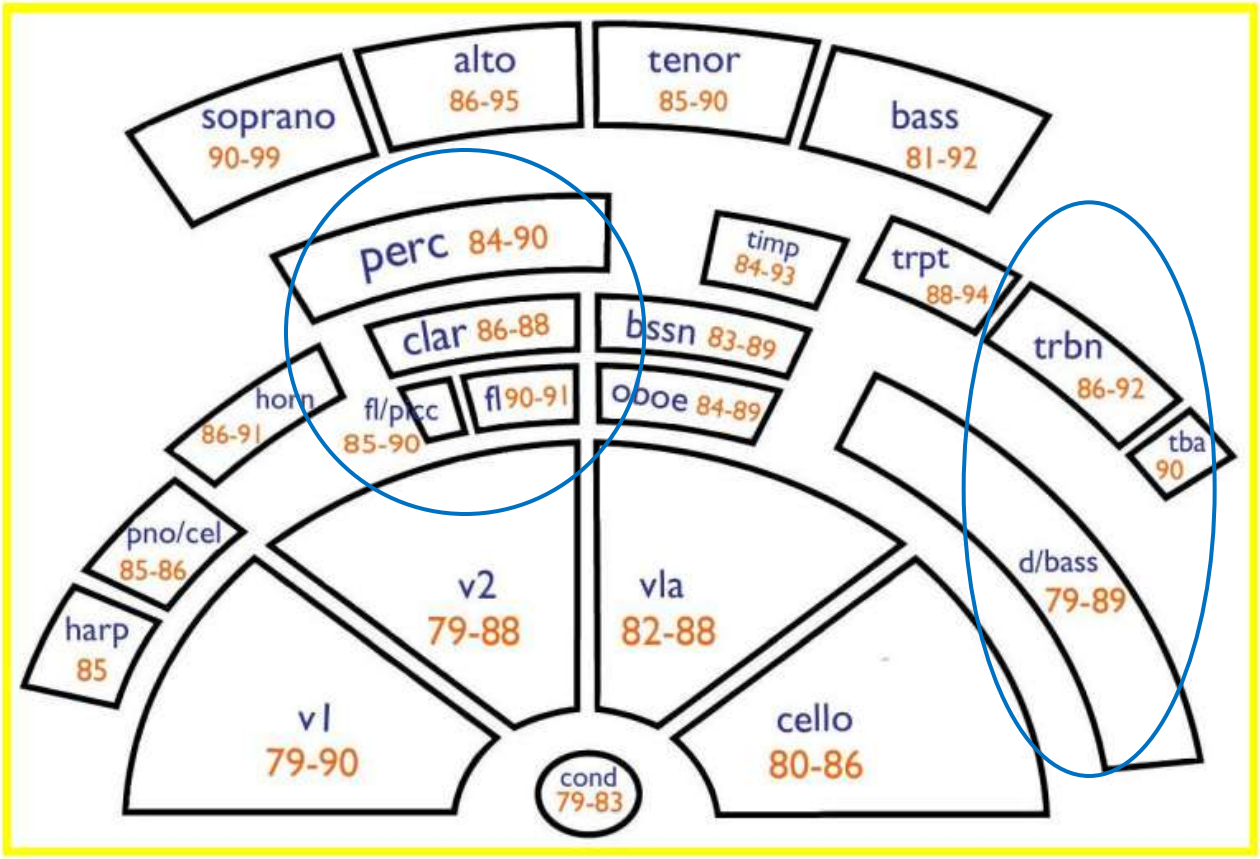
Very Faint

Who has the highest noise dose?



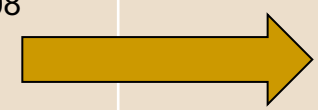
This chart shows relative sizes of sections of an orchestra and typical daily dose of each. It is based on data collected over a range of projects at the BBC during 2008/09. Singers are not shown but they would be at the right of the diagram.

WHAT'S YOUR DOSE? SOME TYPICAL EXPOSURE FIGURES



Ranges given above are based on typical daily doses (Lepd) for two-session days in BBC Maida Vale studios or Studio 7, Manchester, of rehearsals or studio concerts of classical repertoire (not recording sessions, not concert-hall concerts and not amplified repertoire). String readings come from tutti players; violin 1 upper figure is high because some readings were taken from in front of percussion or piano.

Musical Instrument (at 3 meters)	Decibel Level (dB)	Decibel Sound Pressure Level (dB SPL/Peak Level)
Normal Piano practice	60-90	105
Loud piano	70-105	110
Keyboards (electric)	60-110	118
Vocalist	70-85	94
Chamber music (classical)	70-92	99
Violin/viola (near left ear)	85-105	116
Violin/viola	80-90	104
Cello	80-104	112
Acoustic Bass	70-94	98
Clarinet	68-82	112
Oboe	74-102	116
Saxophone	75-110	113
Flute	102-118	126*
Flute (near right ear)	92-104	107
Piccolo	90-106	109
Piccolo (near right ear)	102-118	113
French Horn	92-104	106
Trombone	90-106	125
Trumpet	88-108	113
Tympani and Bass drum	74-94	106
Percussion (high hat near left ear)	68-94	125
Amplified guitar (on stage using ear-monitors)	100-106	118
Amplified Guitar (on stage with wedge monitors)	105-112	124
Symphonic Music	86-102	120-137
Amplified rock music	102-108	140+
iPod in ear canal (Volume=6)	94	110-130**
iPod in ear canal (Full volume)	105	110-142**

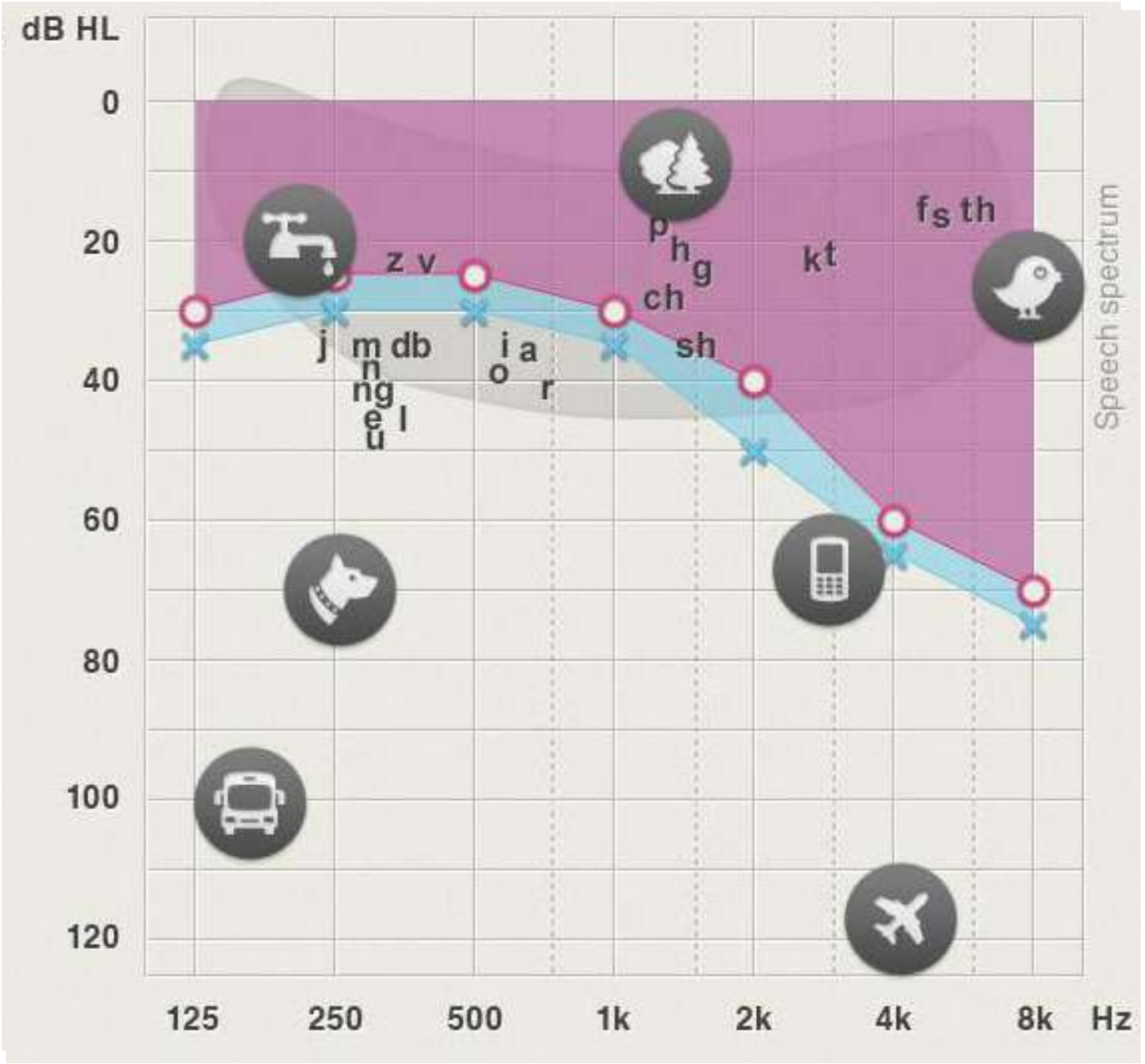


What does this have to do with me?

- Effects of music exposure are
  - Gradual and may not be noticed for years
  - Not limited to hearing
  - Related to intensity (loudness) & duration (length) of exposure

Associated Auditory Symptoms:

- Hearing Loss
  - Trouble hearing certain consonants “s,” “sh,” and “t.”
  - Frequent misunderstanding, need for repetition
  - Difficulty hearing when background noise is present, such as in a restaurant.
  - Difficulty following verbal instructions and/or responding inconsistently
  - Turning up the volume of the television, radio, or stereo
- Tinnitus
  - A constant or intermittent ringing, buzzing, or hissing in your ear.


dB HL
0
20
40
60
80
100
120
125
250
500
1k
2k
4k
8k
Hz
Speech spectrum
z v
j m db
n
ng
e
u
l
i a
o r
p h g
ch
sh
kt
f s th

Some sounds are harder to hear – but crucial!

/s/:

possessives

plurals

past tense

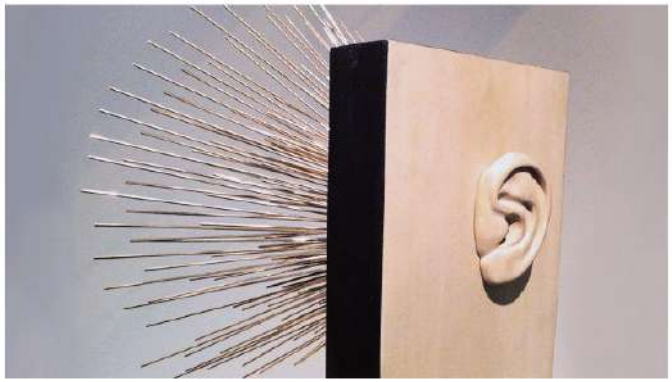
questions

APPLE.NEWS

The Who's Roger Daltrey says he is 'very, very deaf,' urges fans to use earplugs — Fox News

Tinnitus: A Real Problem For Every DJ

By Ean Golden — On May 20, 2012 ADVANCED DJ TIPS



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'I Completely Turned My Back On Music': A Violist's Journey With Hearing Loss

April 17, 2018 Updated Apr 17, 2018 2:27 PM By Peter O'Dowd

Associated Auditory Symptoms:

- Hyperacusis
  - Hypersensitivity to loud sounds
  - Tempting to overuse earplugs but this often decreases your tolerance further so should be avoided
- Pitch Perception Difficulty
  - Muffled hearing or ringing in the ears after you leave a noisy environment
  - Temporary noise-induced hearing loss -- a warning that whatever you were doing was too loud and you were risking hearing loss.

Diplacusis

- The perception of a single sound as two separate sounds -- may differ in pitch or in time.
  - Hearing the same sound differently in each ear
  - Hearing the same sound like an echo in one ear
  - Hearing the sound at the correct pitch in one ear and at a different pitch in the other
  - Typically experienced as a symptom of inner ear hearing loss
- Higher risk if hearing is worse in one ear. e.g. if noise source is consistently on one side

Causes of hearing loss

- Ototoxic meds (can also cause tinnitus)
- Lack of oxygen
- Accident/head injury
- Childhood
  - Infections
  - Prematurity
- Hereditary causes
  - Syndromic
  - Non-Syndromic
- Aging
- NOISE

No. 1 cause of hearing loss: Noise!

- One in four workers exposed to high levels of noise will develop a hearing loss.
- Traffic, construction noise, machinery, gunfire, farm equipment.
- Self-induced:
  - Garden and power tools
  - Recreational sports
- **Source that is most problematic and that we have the most control over: music!**
  - **Earbuds vs headphones**
  - **Concerts**

Sound is problematic if...

- You have to shout over background noise to be heard – or you turn up the music!
- The noise is painful to your ears
- The noise makes your ears ring
- You have decreased or “muffled” hearing for several hours after exposure

Avoid the noise!

- One-third of permanent hearing loss can be avoided.
- Important to
  - Limit or avoid noise,
  - Use hearing protection
  - Be aware of symptoms of hearing problems such as ringing ears.
- Listening to music, wear headphones that go over the ears or noise canceling phones, so you can keep the volume lower.
- If someone can hear sound leaking out, it's too loud.

- Frustrating to ask for things to be repeated.
- Embarrassing when people show impatience.
- Even harder when you don't feel well.
- Lipreading is a difficult skill under the best of conditions:
  - Regional accents
  - Mustaches
  - Eating while talking

Hearing loss makes you work harder to hear

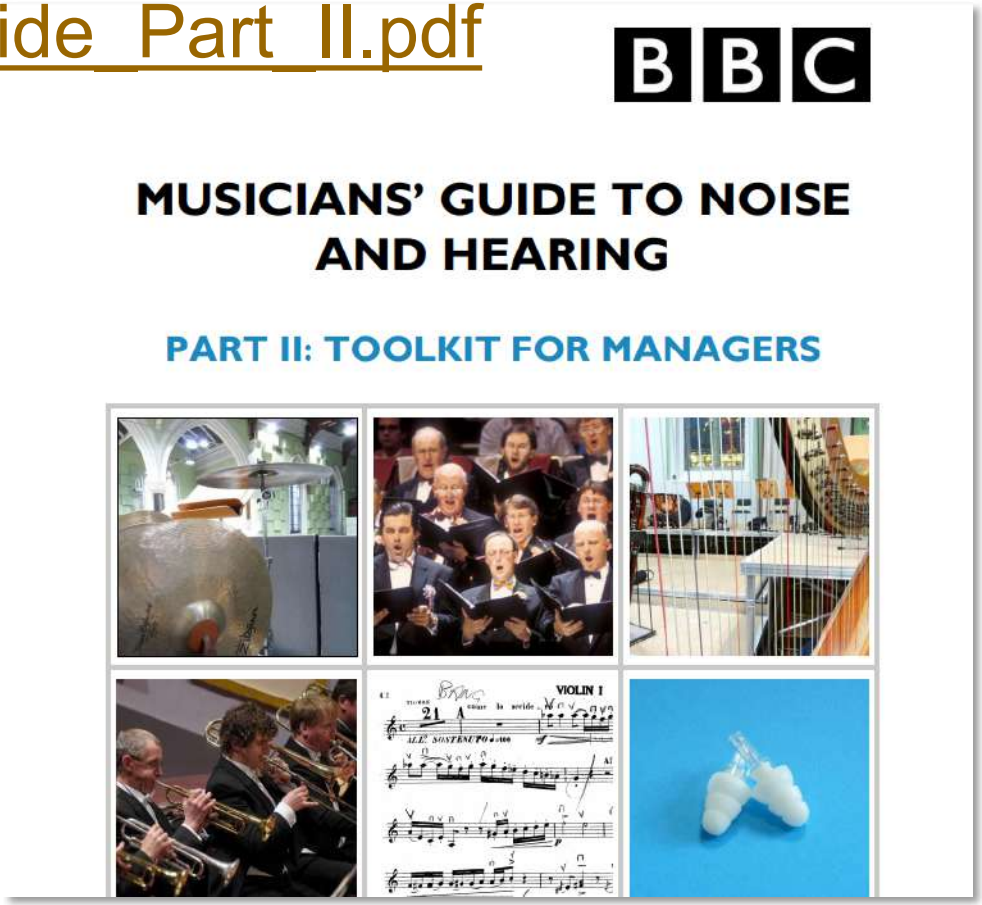
Noise makes listening difficult!

- Overpowers the speaker's voice.
- Makes our brain work much harder to decipher and separate sounds.
- Even someone with only slight hearing loss can feel exhausted after being in a noisy room.

Who's at most risk?

- Orchestral musicians!
- Drummers are particularly at risk, can use quieter practice pads when not performing
- Violinists and violists have more hearing loss in their left ear compared to their right ear -- the violin is placed under the chin with the left ear almost touching the instrument.

- http://downloads.bbc.co.uk/safety/documents/safety-guides/audio-and-music/Safety-Musician_noise_guide_Part_II.pdf



- http://downloads.bbc.co.uk/safety/documents/safety-guides/audio-and-music/Safety-Musician_noise_guide_Part_I.pdf

How to reduce risk

- Measure the noise level at the source using a Sound Level Meter or app like Decibel X.
- Elevated speakers
- Sound treated practice rooms
- Use of risers
- Alternate between pieces of high and low intensity
- Play instruments with less force or practice mutes
- Take frequent breaks from loud noises

How to reduce risk

- Many actions may only reduce exposure by 1-3dB. **A combination of actions adds up.**
- Increasing **vertical** spacing is the single most effective control measure.
- Sound travels in a straight line. The sound of the trumpets can go over the heads of the players in front taking the string players out of the firing line.
- Employ acrylic screens to block sound from the loudest instruments.

How to reduce risk

- Reduce the exposure from a noisy instrument by 3dB by doubling the distance in front of the ‘noise source’
- Schedule music to ensure that musicians are exposed to a mixture of quiet and loud pieces
- Larger orchestral (and choral) forces required for certain repertoire can be balanced across the season by repertoire requiring smaller forces.

How to reduce risk

- Reverberation time can play a part in musicians' perception of sound levels and how loudly they play.
- Stage might accommodate large forces but the venue is not acoustically appropriate – e.g. the ceiling is so low that the sound has nowhere to go.
- Rehearsals shouldn't be in these smaller venues. Avoid scheduling a morning rehearsal after a noisy evening concert.

How to reduce risk

- You can double your exposure time if you reduce the exposure by 3dB. So protect your hearing (e.g. taking off 9dB by wearing musicians' earplugs) for the periods when you can.

DAILY AND WEEKLY DOSE: SOME WORKED EXAMPLES

A HORN-PLAYER'S DAY (NO EARPLUGS)

½hr commute (m'bike)	93dB(A)
3hr session – **Leq**	93dB(A)
1hr lunch (canteen)	85dB(A)
3hr session	94dB(A)
½hr commute (m'bike)	93dB(A)
1hr DIY w/ drill	90dB(A)
TOTAL	**93dB(A) Lepd**

A (BUSY) BASSIST'S DAY

¼hr commute (bicycle)	77dB(A)
3hr session (orch) – **Leq**	84dB(A)
¼hr commute (bicycle)	77dB(A)
1hr teaching	82dB(A)
1hr commute (car/R4)	81dB(A)
1hr jazz reh + 2hr gig	91dB(A)
1hr commute (car/jazz on radio)	87dB(A)
TOTAL	**88dB(A) Lepd**

A HORN-PLAYER'S DAY (WITH 9DB ATTENUATING EARPLUGS)

½hr commute (m'bike)	84dB (A)
3hr session – **Leq**	84dB(A)
1hr lunch (canteen)	85dB(A)
3hr session	85dB(A)
½hr commute (m'bike)	84dB(A)
1hr DIY w/ drill	81dB(A)
TOTAL	**85dB(A) Lepd**

A FREELANCE VIOLINIST'S WEEK

Mon (day off) – **Lepd**	78dB(A)
Tues (rec session)	85dB(A)
Wed (rec session)	85dB(A)
Thurs (rec session)	85dB(A)
Fri (crossover reh+gig)	90dB(A)
Sat (oratorio gig)	87dB(A)
Sun 3hrs string quartet	86dB(A)
TOTAL	**88dB(A) Lepw**

Musician's Ear Plugs

- Wearing filtered earplugs while practicing, performing and listening to live music will protect your hearing from the cumulative effects of overexposure to loud sound.
- Many musicians say they hear their own instruments better, as well as the balance with instruments around them.
- Each ear is unique so having a custom-made mold of each ear gives you the ultimate fit for ear comfort and noise isolation.

Which Musicians Earplug is Right for You?

	ER•9*	ER•15*	ER•25*	ETY•Plugs	ER•20XS	Music•PRO	Harmful Sound Comes From:
Small strings	●	●		●	●	●	Own instrument, other strings
Large strings	●	●		●	●	●	Brass
Woodwinds		●		●	●	●	Brass, percussion
Brass		●	●	●	●	●	Own instrument, other brass
Flutes		●		●	●	●	Percussion
Percussion		●	●	●	●	●	Own instruments, other percussion
Vocalists	●	●		●	●	●	Own voice, speakers, monitors
Acoustic guitar	●	●		●	●	●	Drums, speakers, monitors
Amplified instruments		●	●	●	●	●	Speakers, monitors
Marching bands		●		●	●	●	Multiple sources
Music teachers		●		●	●	●	Multiple sources
Recording engineers		●		●	●	●	Speakers, monitors
Sound crews		●		●	●	●	Speakers, monitors

*Ref: Chasin, M. *Musicians and the Prevention of Hearing Loss.* Singular Publishing Group

Electronic musician's earplugs

- Adaptive earplugs that can adjust to changing sound levels.
- e.g. a band instructor needs to hear questions during practice, but also get protection from the music when the band begins playing.

Musician's earplugs

- Reduces sound levels evenly so that music and speech are clear and natural, not muffled as with other earplugs
- Reduces risk of hearing damage
- Should let musicians hear their own instrument and their blend with others
- Multiple levels of sound reduction
- Interchangeable buttons

Non-Custom plugs

- Deci-Bulz: Inexpensive, semi-custom, lowers volume. Sound quality is not as good

$30

- ER-20: Inexpensive, non-custom, doesn't lower volume as much so not for metal ☺

$25

$12

In-Ear-Monitors

- Replace the traditional and feedback-prone floor monitors and side fill speakers with a small device worn by the performer
- Deliver the monitor mix directly to the ears, at a volume that can be personally controlled.
- Also protect against high levels of ambient noise.
- ***only as good as the impressions taken***.

Proper use of hearing protection!

Figure 1

1. Roll

the earplug up into a small, thin "snake" with your fingers. You can use one or both hands.

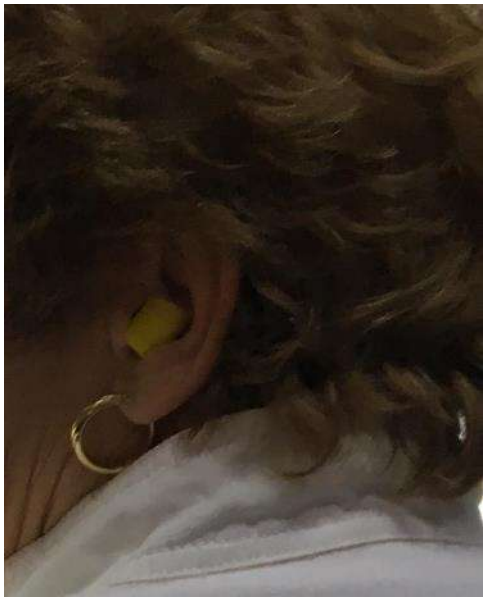
2. Pull

the top of your ear up and back with your opposite hand to straighten out your ear canal. The rolled-up earplug should slide right in.

3. Hold

the earplug in with your finger. Count to 20 or 30 out loud while waiting for the plug to expand and fill the ear canal. Your voice will sound muffled when the plug has made a good seal.

Check the fit when you're all done. Most of the foam body of the earplug should be within the ear canal. Try cupping your hands tightly over your ears. If sounds are much more muffled with your hands in place, the earplug may not be sealing properly. Take the earplug out and try again. (Source: NIOSH)



Improper Fit | Poor Fit | Best Fit For Best Protection

Working with machinery/lawn equipment

- Preferred by people who don't like the way earplugs feel in the ear
- Or if they need some added protection.
- Use both when working in extremely loud environments such as with engines or heavy machinery.

So.... Ear protection

- Use just as much protection as you need or you won't wear them.
- Wear them in both ears!
- Find something that is comfortable but still seals your ears properly.
- Always carry them with you!
- Don't use them "once in a while" or you will never get used to them.


HAVOC
VCU
21

Resources

- http://www.hearingloss.ca/pdf/Musicians%20Earplugs%20-%20Fitting%20Guide.pdf
- http://downloads.bbc.co.uk/safety/documents/safety-guides/audio-and-music/Safety-Musician_noise_guide_Part_I.pdf
- http://downloads.bbc.co.uk/safety/documents/safety-guides/audio-and-music/Safety-Musician_noise_guide_Part_II.pdf