

Hearing Conservation for the Piano Tuner

Quick Reference Handout

How to conserve your hearing as a piano tuner:

1. Annual hearing tests. Ensure audiogram test with extended frequency test: up to 16kHz. Maintain personal copies of your audiograms.
2. Limit hearing Fatigue
 - a. Use quick/easy hearing protection in non-critical environments
 - b. Use high fidelity professional protection in critical listening environments
 - c. Learning curve: conscious awareness of loudness when isolating your ears. It's human nature to just play louder when your ears are plugged, with a net-zero effect.

Types of hearing protection:

- **Universal high-fidelity ear filters:**
Very affordable, not as effective nor comfortable.
Good option to start with.
- **Molded Musicians Earplugs (or Filters):**
Relatively affordable, comfortable, perfect seal – Sensaphonics
- **Active monitoring:**
Most isolation, highest fidelity, powered earphone
ASI Audio x Sensaphonics 3DME – most protective/precise hearing device available today. Only one of its kind. Can double as hearing aids for critical listening environments. ¼ the cost of prescription hearing aids. EQ controls to emphasize important tuning frequencies, and more. Can reduce Fatigue by over 20dB. Highest signal-to-noise ratio.
asiaudio.com • sensaphonics.com

The 5 causes of hearing loss are:

- 1) sound exposure, causes NIHL
- 2) genetics
- 3) cardiovascular health
- 4) disease and injury
- 5) medication and medical treatment

Risks increased with hearing loss:

- 1) Dementia and Memory Loss
- 2) Social Isolation and Depression
- 3) Balance and Spatial Awareness

World Health Organization's Recommended Exposure Limits

(aka, Fatigue Limit)

These limits assume:

- A mostly even distribution of Fatigue over the previous 7 days.
- Ears will remain at or below 70dBA for every second outside of Fatigue exposure, because any sound louder than that will contribute towards Fatigue and cilia damage. 70dBA is the “safe” limit, and the “resting” level
- The effects of audio peaks/spikes may have damaging effects beyond these charts

TERMS

NIHL – Noise Induced Hearing Loss: damage to cilia inside the cochlea

REL – Recommended Exposure Limit – max exposure before damage occurs (tables below)

Fatigue Limit – My term to describe REL, used in the presentation

dB(A) – decibels of sound pressure level, weighted with A-curve, representing human hearing, and used to measure our sound exposure.

Attenuation – decreased frequency sensitivity – The “Silent Killer”

Tinnitus – ringing or buzzing in the ears

Dysacusis – distortion of sound

Hyperacusis – sound perceived louder, pain

Diplacusis – sound perceived as multiple or incorrect pitch(es)

Mode 1: WHO standard level for adults

dB(A) SPL	Weekly (1.6 Pa ² h)
107	4.5 minutes
104	9.5 minutes
101	18.75 minutes
98	37.5 minutes
95	75 minutes
92	2.5 hours
89	5 hours
86	10 hours
83	20 hours
80	40 hours

WHO standard level for sensitive users

dB(A) SPL	Weekly (1.6 Pa ² h)
107	1.5 minutes
104	3 minutes
101	6 minutes
98	12 minutes
95	24 minutes
92	48 minutes
89	1 hour 35 minutes
86	3 hours 15 minutes
83	6 hours 24 minutes
80	12 hours 30 minutes
77	25 hours
75	40 hours

Sound quantities are logarithmic, not linear (like length or weight). But the impacts are linear!

+3dB = 2x energy = ½ safe time.

+6dB = 4x energy = ¼ safe time. (same as getting twice as close to something)

+10dB = 10x energy = 1/10 safe time. (perceived as “twice as loud”)

dB(A)
110+

Loud whistle, Screaming, Garage band in a garage,
Jet plane, Jackhammer

100+

Audience cheering, Motorcycle, Baby crying, Airplane
toilet, Rock concert, EDM concert, Piano Test Blows

100

85

Power tools, Garbage disposal, Headphones,
College party, Piano Test Blows, Piano Tuning

85

75

Vacuum, Coffee grinder, Hair dryer, Public toilet flush,
Average restaurant, Classical concert, Piano Tuning,
PTG Convention Exhibitor hall, Normal piano playing

75

60

Washing and sewing machines, TV, Typical conversation,
Driving, Hanging out, Piano Tuning, Pianissimo playing

50

Refridgerator, Dish washer, Light rainfall,
Electric toothbrush, Coffee machine

40

Quiet Library, TV heard through wall, Domestic
ambience, Flourescent lights, Whispering

30

Can you even still hear this?

Additional Notes:

- Piano tuning, on average, is about 82dBA. While this depends on a LOT of factors, and your tuning exposure may be lower, don't risk it!
- Basic things at home can easily put us over the REL/Fatigue Limit: vacuuming, putting away dishes/silverware, slamming toilet lid, dog barking, power tools, etc.
- Noise cancelling consumer products can be useful, but are not rated for hearing protection.

This page on my website has some info and resources, and will I eventually make it better.

whitehousepiano.com/hearing

Please feel free to reach out to me for clarification or help to find your personal best options.

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