BE INFORMED AND PROTECT YOUR HEARING:

IMPORTANT RESULTS ON PREVALENCE OF HEARING LOSS AND HEARING EXPOSURE STUDIES FOR TEACHERS OF SINGING

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INTRODUCTION

CAN YOU SING IT OR TEACH IT IF YOU CAN'T HEAR IT?

INTRODUCTION

- What is my voice student paying for in voice lessons?
  1. MY TRAINED EARS
     - my analysis and discernment of what will build the voice in a healthy way AND for the student's singing style
  2. MY ABILITY TO SAY "WHAT TO DO NEXT"
     - repertoire choices
     - knowledge of technique and pedagogy
     - "next" technical goal or exercise
     - "next" challenge of singing range or emotional content

INTRODUCTION

- Occupational hazards of performing artists: a growing field
  - Repetitive use injuries
  - Physical safety
  - Noise exposure
- Noise exposure is of particular interest to musicians
  - Studio exposure
  - Rehearsal/performance exposure
  - Impact on professional career as performer and teacher

OBJECTIVES

- Understand basic anatomy and physiology of the ear
- Describe the prevalence of hearing loss in singers and voice teachers
- Describe the noise exposure risks to voice teachers in studios and rehearsal/performance venues
- Discuss hearing preservation strategies in studio, rehearsal and performance venues
- Discuss resources available for occupation associated hearing loss

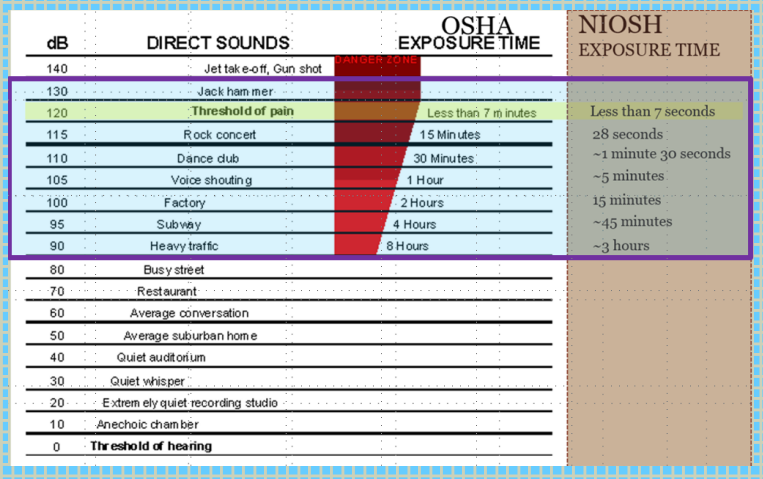
INTRODUCTION

- Singers and voice teachers need to be able to consistently rely on the accuracy of their hearing at all audible frequencies much more than the general population.
- It is common knowledge that exposure to high noise levels for prolonged periods of time can result in high frequency hearing loss (HFHL).

DEFINITIONS

- Objective hearing loss (OHL)
  - 30 dB or greater in any of the tested frequencies, in either or both ears.
- High frequency hearing loss (HFHL)
  - 25 dB or greater for the pure tone average of the 4 kHz, 6 kHz, and 8 kHz frequencies for either or both ears.
- Speech frequency hearing loss (SFHL)
  - 25 dB or greater for the pure tone average of the 1 kHz, 2 kHz, 3 kHz, and 4 kHz frequencies for either or both ears.

SOUND LEVEL ENVIRONMENT OF SINGERS



Choral 86 to 110 dB
Solo singer > 110 dB
Orchestra 80-135 dB

DEFINITIONS

Degree of hearing loss	Hearing loss range (dB HL)
Normal	–10 to 15
Slight	16 to 25
Mild	26 to 40
Moderate	41 to 55
Moderately severe	56 to 70
Severe	71 to 90
Profound	91+

ASHA Degree of hearing loss scale

Degree of hearing loss	Hearing loss range (dB HL)
Normal	–10 to 25
Slight	
Mild	30 to 40
Moderate	45 to 55
Moderately severe	60 to 70
Severe	75 to 85
Profound	90

Modified ASHA Degree of hearing loss scale

PREVALENCE OF HEARING LOSS IN TEACHERS OF SINGING AND VOICE STUDENTS

LUCINDA HALSTEAD MD
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METHODS

- 167 recruited
  - 9 self-identified as neither teacher nor student
- 158 participants data was used
  - 103 female; 55 male
  - 58 self-identified as a voice teacher,
  - 106 self-identified as a vocal student
  - 6 self-identified as both
  - Ages ranged from 15-72 years; mean age of 32 years.

RESULTS

Years teaching has a higher Odds Ratio than age for OHL, HFHL, and SFHL

Implying…

A career as a voice teacher leads to both HFHL and SFHL faster than age alone

RESULTS

Years teaching had a higher Coefficient on linear regression than age for OHL severity, HFHL severity, and SFHL severity

Implying…

A career as a voice teacher leads to faster progression of both HFHL severity and SFHL severity than age alone

DISCUSSION

- **50% of our overall study population between ages 25 and 75 years had hearing loss**
- **51.7% of all teachers screened had OHL**
- **43.1% of all teachers screened positive for HFHL**

CONCLUSION

- This study has shown that the prevalence of OHL, HFHL, and SFHL is greater in voice teachers than in the general population.
- The findings from this study indicate that a career as a voice teacher can lead to the development of OHL, HFHL, and SFHL faster than the general population, and can lead to faster progression of OHL, HFHL, and SFHL than in members of the general population.

IMPLICATION

- The results of this study indicate that there is a need for better awareness of the effects of a career as a voice teacher on hearing loss.
- We recommend that all voice teachers and student singers get a hearing screen done and implement practices to help preserve their hearing.
- Suggestions to help preserve hearing to follow

Occupational Noise Exposure in College Level Teachers of Singing

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DEANNA MCBROOM, MM; LUCINDA HALSTEAD, MD

PRESENTED AT THE VOICE FOUNDATION 44TH ANNUAL SYMPOSIUM, MAY 26-31, 2015, PHILADELPHIA, PA

INTRODUCTION

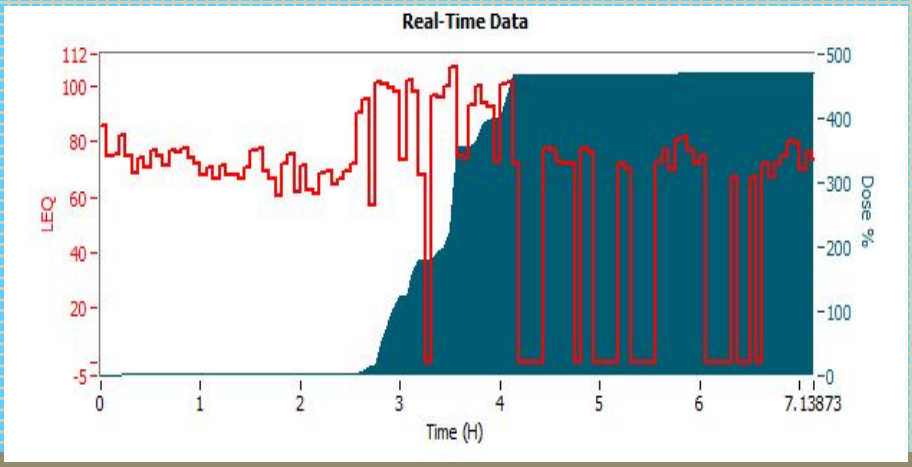
- Trained voices capable of substantial sound intensity
- Acoustic power around 3000 Hz, resonant frequency of the external auditory canal
- Studios often small while voices are "big"
- Anecdotal reports of tinnitus from singing teachers in studio setting
- Our study looked at noise exposure in college-level teachers of singing

METHODS

- Approved by the Institutional Review Board of the Medical University of South Carolina
- Used Etymotic Research ER-2007DW personal noise dosimeters
  - NIOSH standard 3dB exchange rate
- Survey of teaching history and subjective hearing difficulty

RESULTS

- Sample Data readout



RESULTS

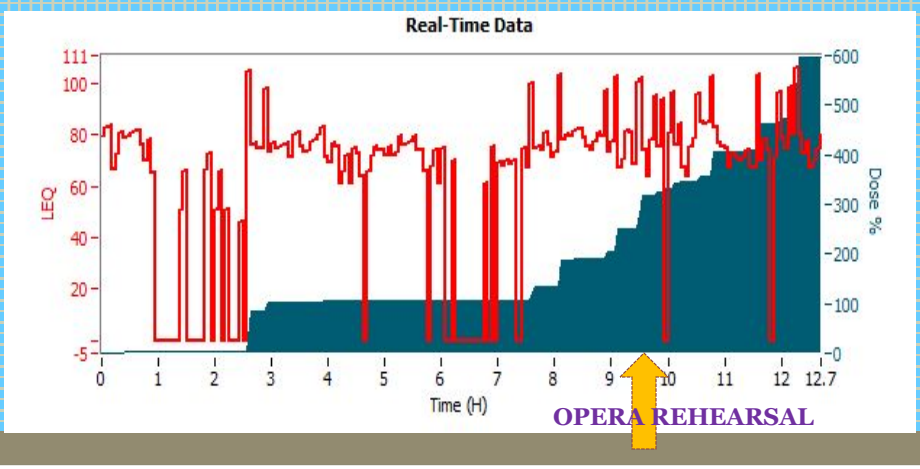
- One sample t-test of mean dose vs 1.0x daily dose
- Mean dose: 3.65x daily dose
  - *p=0.0223*
- Versus 0.5x daily dose
  - Threshold where hearing protection is recommended
  - *p=0.0088*

DISCUSSION

- Noise levels exceeding 100% of recommended daily dose are present in the studios of some teachers of singing
- Unclear whether this exposure actually reflects what the teachers are receiving at their ears

DISCUSSION

- Exposures outside studio were often a substantial factor



DISCUSSION

- Unclear whether teachers' ears were exposed to the same levels as the meter
- Substantial variance between teachers
- Variance between same teacher on different days

CONCLUSION

- Teachers of singing *may* be routinely exposed to significant levels of noise during their working days
- Unclear whether this reflects the levels received at the ears
- In the meantime, teachers should consider practical ways of reducing their occupational noise exposure out of an abundance of caution

FUTURE DIRECTIONS

- Preliminary data using a microphone at the level of the ear canal suggests that the ear closer to the piano may get more noise exposure
- Further studies of students with big voices needed to determine impact on teacher's hearing in studio setting

WHAT SHOULD SINGERS & TEACHERS DO?

- Be aware of studio size and layout
  - Baffling
  - Proximity of student
  - Upright vs grand piano
  - Ear plugs?? Unilateral vs bilateral
- Consider other sources of exposure
  - Rehearsals
  - Performances

WHAT SHOULD SINGERS & TEACHERS DO?

- Currently on Broadway, children performers are wearing one ear plug and alternating the side each day
- How can the layout of rehearsal space be optimized for hearing protection for students and teachers?
- What percentage of the rehearsal needs to be full out singing?

SOUND LEVEL METER APPS

- Dozens of them for computer and mobile devices
- Surprisingly accurate – usually within 5 dB of a professional Sound Pressure Meter
  - Protective cover on phone or computer may decrease accuracy
    - Check with known dB level noise with cover on and off
- Most are free
- NIOSH app
  - Highly rated and free
  - They set the standards

EAR PLUGS

- Usually 20 -23 dB flat attenuation good for musicians
  - Maintains fidelity especially in high frequencies
  - Check specifications
  - Range from ~20 -27 dB (silicone),>33dB foam
- Multiple designs to fit ear canals of all sizes
- Off the shelf
- Price range ~ $12 - $30
- CARRY THEM WITH YOU AT ALL TIMES!!
  - Purse, music bag, pocket

EAR PLUGS

- CARRY THEM WITH YOU AT ALL TIMES!!
  - Purse, music bag, pocket
  - Situations:
    - Movie theaters
    - Restaurants with live music
    - Many concerts and live theater performances
    - Unanticipated construction noise – huge
    - Lawn mowers
    - Hair dryers

HEADPHONE & EAR BUD SAFETY

- Very easy to get too much dB into ears even at lowest setting on mobile phone or other portable music device
  - Varies with type of ear bud and your ear canal anatomy
  - If your ears are ringing even on lowest setting, you should investigate other styles of ear plugs

HEADPHONE & EAR BUD SAFETY

- Fairly easy to check output with sound pressure level apps for computer or phone
  - Take any protective cover off your phone for most accurate results
  - Start with lowest volume setting on phone or portable music device
  - Place the ear bud next to the microphone of the computer or phone and the dB output will be shown

HEADPHONE & EAR BUD SAFETY

- Noise attenuating/cancelling headphones & ear buds
  - Decrease the dB level to the ear by ~20 dB
  - Allows music and other auditory input to be heard at a lower dB level
    - Example: difference between regular and noise attenuating ear buds on an airplane

ANTIOXIDANTS FOR INNER EAR

- Blueberries
  - Antioxidants particularly protective of hair cells of the inner ear

http://www.momjunction.com/articles/blueberries-for-babies_00414267/#gref

SOURCES OF HELP

- State Vocational Rehabilitation Services that can help provide hearing aides at low cost or no cost
  - Get them while you are employed !

SCENARIO ONE: THE STUDIO

- Studio dimensions: 14x20 feet
- Grand or upright piano position:
- Student position:
- Mirror(s) position:
- Acoustics of room – ways to enhance:
- Monitor dB with phone APP

SCENARIO ONE: THE STUDIO

- Suggestions for hearing protection:
  - Avoid singing along with your student
  - Limit time of student "singing over your shoulder" to read off piano's music rack
  - Avoid speaking/singing directions to student or pianist over student's singing
  - Develop skills with non-verbal communication
  - Limit back-to-back lessons to 3 or 4 in a row
  - Take "Quietness" breaks
  - EAR PLUGS: Alternate ears daily

SCENARIO TWO: CHORAL REHEARSAL

- Size and shape of the rehearsal room
- Configuration of the choir – in the round, on risers, in rows, standing or seated, etc.
- Acoustics of rehearsal space
- Amount of full out singing, pacing of tessitura, range, & volume
- Position and Volume of the piano for accompaniment
- Monitor dB with phone APP

SCENARIO TWO: CHORAL REHEARSAL

- ALTERNATIVES TO FULL-OUT SINGING:
  - Count-singing
  - Speaking text
  - Mark words in rhythm (speaking)
  - Discuss emotional content verbally to avoid over-singing
  - Sing phrase out once, then mark on repeats
  - Give directions for repetition, don't just say, "Do it over!"

SCENARIO THREE: CHORAL REHEARSAL WITH ORCHESTRA

- Acoustics of practice space
- Volume of the orchestra
- Baffling of the brass and percussion instruments
- Conductor/choral director interaction
- Monitor dB with phone APP

SCENARIO FOUR: OPERA REHEARSAL

- Ensembles & chorus - minimize singing "in each other's ears"
- Encourage "marking" for repeated sections
- "Sing front" despite body angle and attitude directions
- Spatial arrangement with piano or orchestra
- Acoustics of space
- "Quietness" breaks
- EAR PLUGS – alternate ears daily
- Monitor dB with phone APP

SCENARIO FIVE: THE RECORDING STUDIO

- Studio dimensions
- Acoustics of room
- Headphones
- Arrangement of musicians and instruments/amps
- Monitor speakers available?
- Length of recording session
- Number of repeat "takes"

THANK YOU

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