Tinnitus Assessment in Young Musicians

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Young Musicians

Musicians who are also young...
1) "Young" – under 18 years
2) "Musician" – one who participates in music

School band  Marching band
Garage band
School choir  Music listener

Photos from www.dreamstime.com and www.na
Young Musicians

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Why talk about youth?

• Tinnitus in youth is under reported and poorly understood
• Children are at high risk for intense and sustained sound exposure
• Medical-legal issues with minors
• Limited education/exposure
• Psychosocial aspects
• Invincible youth

Why talk about musicians?

• Cultural sensitivity training for musicians
• Emphasis on hearing/listening acuity
• Musicians are at high risk for intense and sustained sound exposure
• Unregulated industry
• Limited education
Google Search: “Cool Ear Plugs”

Why do I care?

- Audiologist
- Musician
- Tinnitus

• Evaluate and treat patient
• Hearing conservation
Why do I care?

Audiologist
• Evaluate and treat patient
• Hearing conservation

Musician
• Hearing conservation
• Music conservation

Tinnitus
• Improve care for patients
• Educate music community

Case study

14 year old male presents with tinnitus
• temporary tinnitus after noise exposure for past 1 year
• now constant high pitch 'ring' and 'hiss'
• exacerbated by rock band practices and shows
• interferes with regular sleep schedule
• concerned he is losing his hearing completely
**Case study**

14 year old male presents with tinnitus

First Audiology visit:
- Hearing “within normal limits”
- Musician’s Earplugs recommended
- Impressions taken and plugs mailed home
- return if issues with plugs

**Discussion points:**
1. No measurement of patient distress
2. “Within normal limit” hearing is NOT a sufficient answer for a young aspiring musician
Case study

Discussion points:
1. No measurement of patient distress
2. "Within normal limit" hearing is NOT a sufficient answer for a young aspiring musician
3. Hearing conservation does not START with ear plugs, especially for musicians
4. No fitting verification or instructions for attenuation use (plugs mailed home)

Case study

A young-adult/child:
• is not a small adult
• understands what you are saying to their parents
• wants to be involved in the decision making process

Photos from www.dreamstime.com and www.s

Tinnitus

A perceived sound (ringing, buzzing, hissing, etc) that cannot be attributed to an external stimuli

• Phantom auditory perception (Jastreboff, 1990)
• Commonly perceived in sustained quiet
  – 94% (Heller and Bergman, 1953)
  – 64% (Tucker et al, 2005)
• 10-25% report clinical significant tinnitus (dependent on age, location, and clinical definition)
• Noise exposure is the most common cause
Presentations of Tinnitus

- Transient "spontaneous" tinnitus (TST)
- Temporary & TTS (Temporary Threshold Shift)
- Chronic
  - High pitched ringing (tonal)
  - Hissing (noise)
  - Buzzing (multi-tonal)
- Medically significant
  - Unilateral, pulsatile, low pitched, correlated symptoms

My Tinnitus

Download my tinnitus!  http://tinyurl.com/FW-My-Tinnitus

Audio clip copyright Frank Warti

Tinnitus Effects

- Emotional distress – tinnitus perceived as threat to health, career, quality of life, etc (Hallam et al, 1988)
- Cognition – reduced capacity for voluntary, conscious, effortful, and strategic control (Rossiter et al, 2006)
- Attention – impaired selective and divided attention (Stevens et al, 2007; Eronlein et al, 2007)
- Sleep disturbances – direct response to perception of tinnitus or unrelated stress-induced insomnia (Ramkumar and Rangasayee, 2010)
**Neurophysiologic origins**

- Jastreboff, Hazell and Graham (1994) described a neurophysiologic model of tinnitus pathogenesis involving reorganization of central auditory pathways and changes to sensory-modulated parts of the limbic system.
- Peripheral hearing loss causes reorganization of cortical tonotopic map (overrepresentation of edge frequencies) (Rajan and Irvine, 1998).
- Muhlau (2006) demonstrated structural brain changes on MRI in patients with tinnitus:
  - Gray-matter decrease in subcallosal area
  - Gray-matter increase in the auditory thalamus

**HYPERACOUSIS**

Discomfort when exposed to a sound that would not evoke a similar reaction in an average listener. Physical characteristics of the sound are the only modulating factor.

- Commonly concurrent with tinnitus
- Exacerbation of tinnitus is a common reason for avoidance of loud noises or specific sounds
- May limit a musician’s enjoyment of certain musical situations

**MISOPHONIA**

A “hatred of sound” modulated by the patient’s previous experience and the presentation context.

**AURAL DISTORTIONS**

Artifact, distortion of intensity growth, or “frequency splatter”. Usually heard with high inputs and often unilateral.

- Commonly reported concern by musicians, particularly mixing engineers
- Motivation for softer music situations (quieter mixing levels or switching to an acoustic setup)
Prevalence

Tinnitus in Children

97% 3rd graders self-reported hazardous sound exposure (n=273) (Blair et al, 1996)
60%–85% young people report tinnitus after loud music exposure without other audiologic complaints (Gilles, 2012)
75% children with tinnitus report sleep difficulties (Kentish et al, 2000)
17.1% 13 – 19 year olds have noise sensitivity (Widen & Erlandsson, 2004)
10.7% 12 – 18 year olds with noise-induced threshold shift (Henderson et al, 2011)
16% 12 – 18 year olds listen to music players at levels >NIOSH (Martin et al, 2008)
8.7% 13 – 19 year olds have permanent tinnitus (Widen & Erlandsson, 2004)

Tinnitus in Children

- 6% – 55% of normal hearing children and 25% – 66% of hearing impaired children have tinnitus, depending on study (Nodar and Lezak, 1984; Graham and Butler, 1984; Stouffer et al, 1992; Baguley and McFerran, 1999)
- Common concern for parents and children is that tinnitus perception is a sign of hearing loss, worsening of established hearing loss, sign of mental health or catastrophic health problem (Sketye and Kennedy, 2009)
- Children complain less and are more tolerant of ailments
- Neural plasticity and natural coping methods may cancel out limited cognitive habituation ability
Assessment of Tinnitus

**IMPAIRMENT** - dysfunction of auditory system
- Audiological testing (thresholds, loudness discomfort, etc)
- Psychoacoustic measures (pitch, loudness, masking, etc)

**DISABILITY** - reduced abilities (activity limitation) on an individual to function in normal manner as a consequence of the tinnitus impairment
- Iowa Tinnitus Questionnaire
- Beck Depression Inventory
- Beck Youth Inventory

**HANDICAP** - psychosocial manifestations of impairment and disability that result in the need for extra effort and reduced independence
- THI, TRQ, TFI

Assessment of Tinnitus

<table>
<thead>
<tr>
<th>Interview</th>
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<tbody>
<tr>
<td>Time and nature of onset</td>
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<tr>
<td>Progression of severity</td>
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<tr>
<td>Aural description</td>
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<tr>
<td>Lateralization</td>
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<tr>
<td>Perceived cause</td>
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<tr>
<td>Emotional impact</td>
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<tr>
<td>Exacerbating factors</td>
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<tr>
<td>Relieving factors</td>
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</tbody>
</table>

Adapted from AAA Audiologic Guidelines for the Diagnosis & Management of Tinnitus Patients (2000)
Assessment of Tinnitus

Interview

- Different wording for youth
  - Do you ever hear noises or sounds in your ears?
  - What do you call them?
  - What makes them go away, or get better?
  - What do you do when you hear them?
  - How do the sounds make you feel?
- Draw me a picture of your tinnitus
- Identify parental worries as well as patient worries
  - How is tinnitus affecting life at home and at school

Clinical evaluation of tinnitus

Audiologic Evaluation

- Comprehensive audio
  - Thresholds, Speech discrim., MCL, LDL, QuickSIN
- Otoacoustic Emissions
  - Transient Evoked and Distortion Product (at least to 8k Hz)
- Psychoacoustic measures
  - Pitch matching
  - Loudness matching
  - Minimum masking level
  - Residual inhibition

TRQ - Tinnitus Reaction Questionnaire

- Wilson et al, 1991

Screening instrument that distinguish tinnitus sufferers who cope with the problem from those who do not cope well, and as a measure of psychological distress before and after treatment.

- 25 items in one total score (no subcategories)
- responses on 5 point scale
Clinical evaluation of tinnitus

Questionnaires with Youth

- Discussion of Suicide
  - TRQ specifically addresses
  - Appropriate referrals must be ready
  - Legal implications of answer from a minor
  - Parental access to medical records
  - Negative ideation / power of suggestion

THI – Tinnitus Handicap Inventory

- Newman, Jacobson & Spitzer, 1996

Self-report tinnitus handicap measure that can be used in a busy clinical practice to quantify the impact of tinnitus on daily living.

- 25 items in 3 subcategories:
  - functional, emotional, and catastrophic
- Response in three levels
  - yes = 4
  - sometimes = 2
  - no = 0
Clinical evaluation of tinnitus

TFI - Tinnitus Functional Index
- University of Oregon, 2008; Meikle et al., 2011
  
  Systematic focus on responsiveness resulting in larger effect size for detecting change in severity rating.

  - Items relating to the THI Catastrophic subscale (suicide, despair, and fear of having a terrible disease) were omitted as these negative ideations may create feelings of negativity prior to treatment or evaluation. (TFI 2013 Starkey Blog)
  
  » 25 items in 8 subcategories
  » Response of 0 – 10 (0% - 100% in some sections)
Clinical evaluation of tinnitus

<table>
<thead>
<tr>
<th>Survey</th>
<th>Responses</th>
<th>Subscaloes</th>
<th>Scoring</th>
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</thead>
<tbody>
<tr>
<td>TRQ</td>
<td>0 - 4 scale</td>
<td>0</td>
<td>Total score 0 – 104</td>
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<td></td>
<td></td>
<td></td>
<td>&gt; 17 = Significant</td>
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<td>60 = 90th percentile</td>
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<td>72 = 95th percentile</td>
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<tr>
<td>THI</td>
<td>3 tiers</td>
<td>3</td>
<td>Total score 0 – 100</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>0 - 16 = no handicap</td>
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<td></td>
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<td></td>
<td>18 - 36 = mild handicap</td>
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<td></td>
<td>38 - 56 = moderate handicap</td>
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<td></td>
<td>58 - 100 = severe handicap</td>
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<tr>
<td>TFI</td>
<td>0 – 10 scale (variable)</td>
<td>8</td>
<td>Total score 0 – 100</td>
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<td>&lt; 25 = mild tinnitus</td>
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<tr>
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<td></td>
<td></td>
<td>25 - 50 = significant problems</td>
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<tr>
<td></td>
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<td>&gt; 50 = severe</td>
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Using questionnaires with Youth

- No child/youth specific questionnaire developed
- Normative data may not translate to children
  - Not valid for pre-treatment/post-treatment outcomes?
- Test-taking mentality
  - Not a quiz
  - Won't be graded
  - No right or wrong answers
Clinical evaluation of tinnitus

Youth Attitude Toward Noise Scale (YANS)

- Gilles et al., 2012
  - influence of permanent/transient tinnitus after loud music
  - attitudes toward noise
  - influence of peers
  - ability to manipulate hearing protection (HP)


Clinical evaluation of tinnitus

Questionnaires with Youth

- "Negative Affect"
  - influence the results on all self-report measures (Watson & Pennebacker, 1989)
  - Pure measures of negative affect (Beck Youth Inventory) may help explain the patient's self-reported tinnitus distress score. (Baguley, 2003)
- Allure of disaster
  - Longing for tragedy or excitement (heroicism, risk taking)
- Teenager "-tude"
  - 'I'm bored' - 'school sucks, life sucks' - 'whatever'

Conclusions

- TFI - most kid appropriate, but most complicated form
  - consider going ‘off form’ and verbally asking questions
  - If using questionnaires with catastrophic (suicide, depression, despair) questions, be ready with referrals ad legal action plan
- Not treating an adult, treating patient and family
- Hearing conservation for musicians
  - Starts with education, not ear plugs
  - Meet them half way and respect the culture
- Music conservation for Audiologists
  - Save the musician and save the music
Thank You!

Time for questions?

References

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Colleen G. Le Prell, PhD

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