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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
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.naver.com

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
- Evaluate and treat patient
- Hearing conservation

Musician

Tinnitus
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

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

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.shutterstock.com
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 Wartinger 2011

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.

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

- 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

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

Source: 1994-1995 National Health Interview Study Disability Supplement. Chart created by the NIDCD Epidemiology and Biostatistics Program. (Hoffman & Reed, 2004)
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)

79% children with tinnitus reported sleep difficulties (Kentish et al, 2000)

17.1% 13 – 19 year olds have noise sensitivity (Widen & Erlandsson 2004)

16.7% 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

Interview

- Time and nature of onset
- Progression of severity
- Aural description
- Lateralization
- Perceived cause
- Emotional impact
- Exacerbating factors
- Relieving factors

- Noise history
- Medications
- Familial history
- Effect on sleep
- Effect on hearing
- Effect on concentration
- Effect on relationships

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

• 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
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>Subscal es</th>
<th>Scoring</th>
</tr>
</thead>
</table>
| TRQ    | 0 - 4 scale | 0          | Total score 0 – 104  
> 17 = Significant  
60 = 90th percentile  
72 = 95th percentile |
| THI    | 3 tiers    | 3          | Total score 0 - 100  
0 - 16 = no handicap  
18 - 36 = mild handicap  
38 - 56 = moderate handicap  
58 - 100 = severe handicap |
| TFI    | 0 – 10 scale (variable) | 8          | Total score 0 - 100  
< 25 = mild tinnitus  
25 - 50 = significant problems  
> 50 = severe |
Clinical evaluation of tinnitus

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

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

References

- Salviati, et al. (2013). The Tinnitus Handicap Inventory (THI) as a screening test for psychiatric comorbidity in patients with tinnitus. Psychosomatics. 54:248-256