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Tinnitus Assessment in Young Musicians

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Young Musicians

Musicians who are also young…

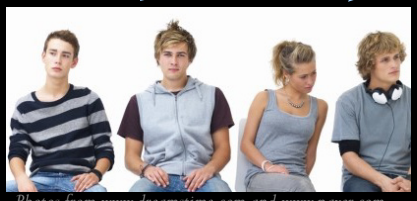
1) 'Young' – under 18 years
2) 'Musician' – one who participates in music

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



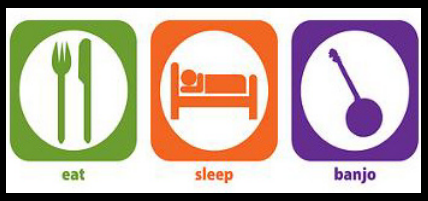
Photos from www.dreamstime.com and www.naver.com

Why talk about youth?

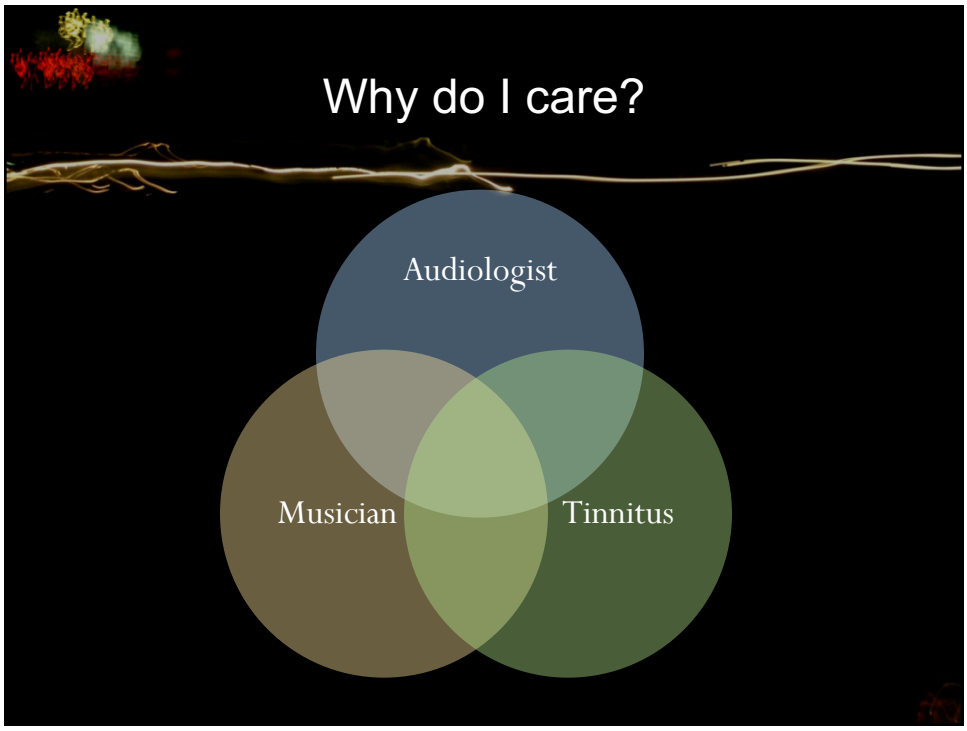
- Tinnitus in youth is under reported and poorly understood
- Children are at high risk for intense and sustained sound exposure
- Medical-legal issues with minors
- Limited education/exposure
- Psychosocial aspects
- Invincible youth

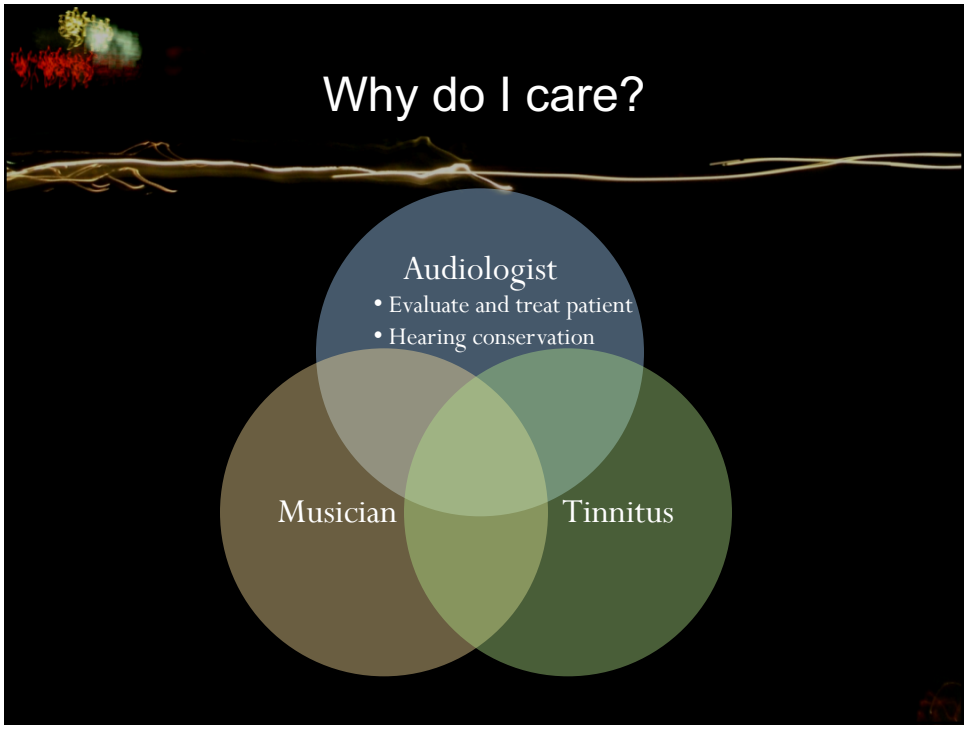
Why talk about musicians?

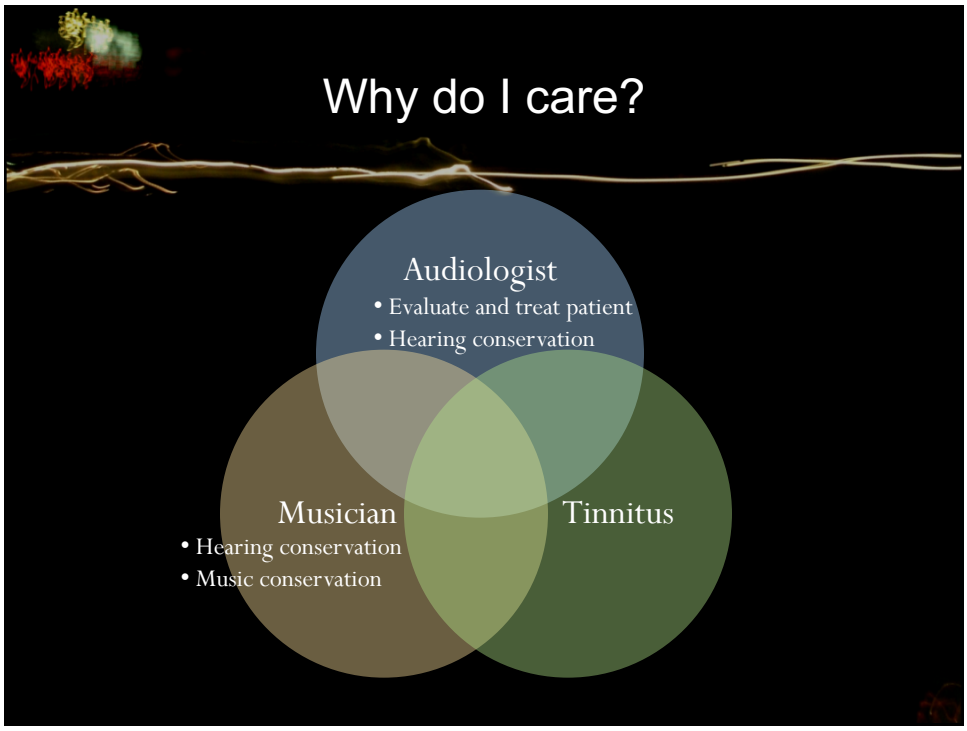
- Cultural sensitivity training for musicians
- Emphasis on hearing/listening acuity
- Musicians are at high risk for intense and sustained sound exposure
- Unregulated industry
- Limited education



Google Search: *"Cool Ear Plugs"*


Why do I care?
Audiologist
Musician
Tinnitus


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


Why do I care?
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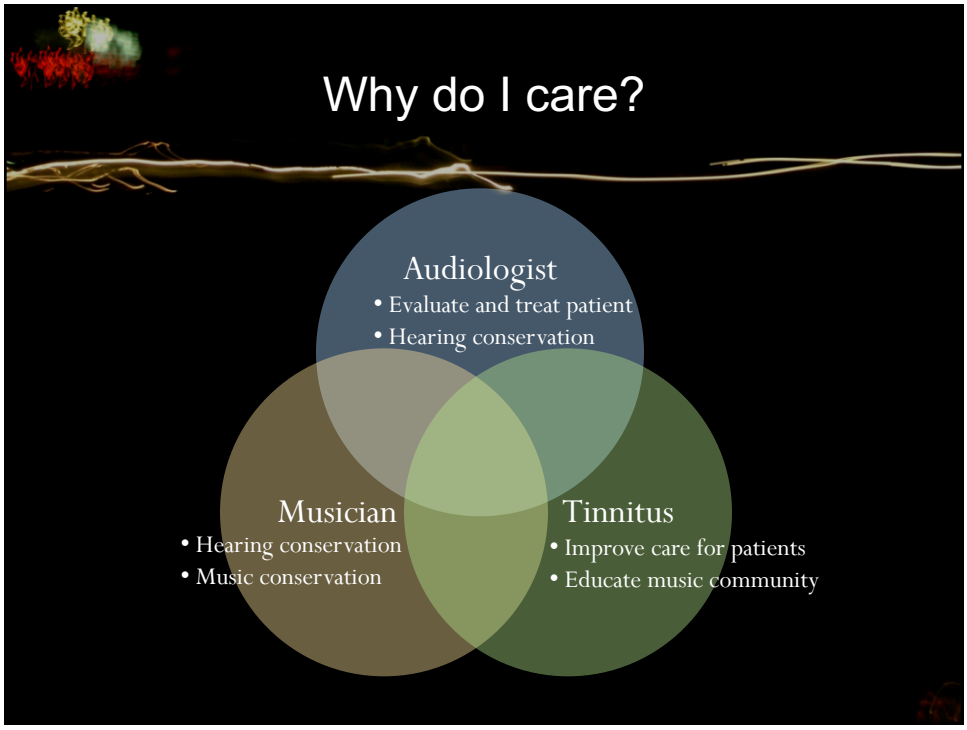
• Music conservation
Tinnitus


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

Case study

14 year old male presents with tinnitus

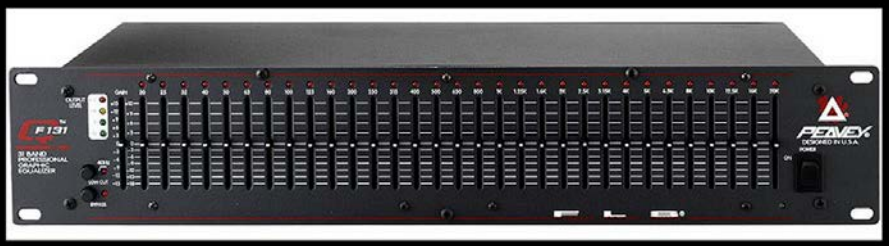
First Audiology visit:
- Hearing “within normal limits”
- Musician’s Earplugs recommended
- Impressions taken and plugs mailed home
- return if issues with plugs

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



Case study

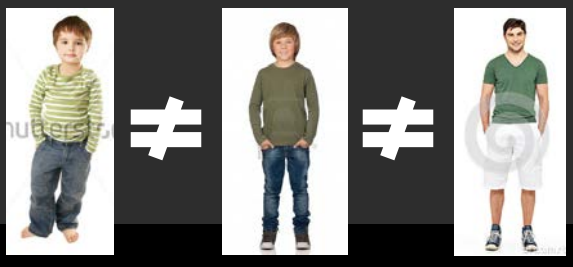
Discussion points:

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.shutterstock.com

Tinnitus

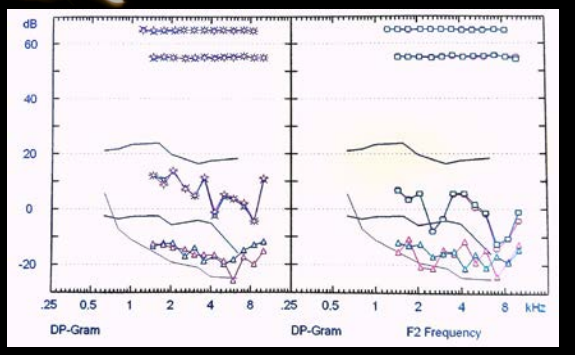
A perceived sound (ringing, buzzing, hissing, etc) that cannot be attributed to an external stimuli

- 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

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
- Roberts, et al (2010). *Ringing Ears: The Neuroscience of Tinnitus*. J. Neurosci. 30(45)

HYPERACOUSIS	MISOPHONIA
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.	**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

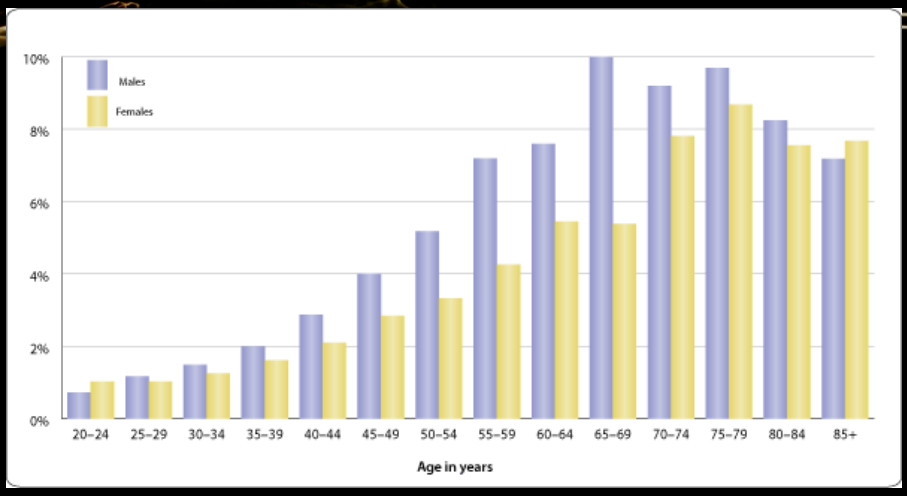
Jastreboff , M., Jastreboff , P.J. (2002). Decreased sound tolerance and Tinnitus Retraining Therapy (TRT). Australian and New Zealand Journal of Audiology, 24(2): 74-84

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 ***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

Clinical evaluation of tinnitus

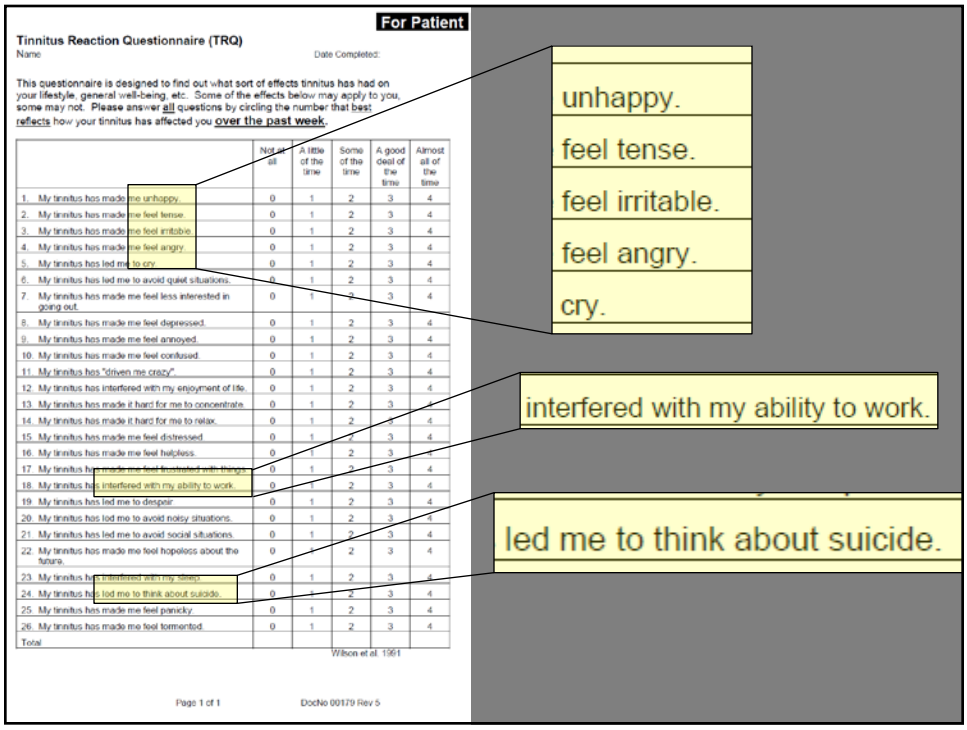
TRQ - Tinnitus Reaction Questionnaire

– 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
    - HIPAA Privacy Rule www.hhs.gov/hipaafaq/personal/index.html
  - Negative ideation / power of suggestion

Clinical evaluation of tinnitus

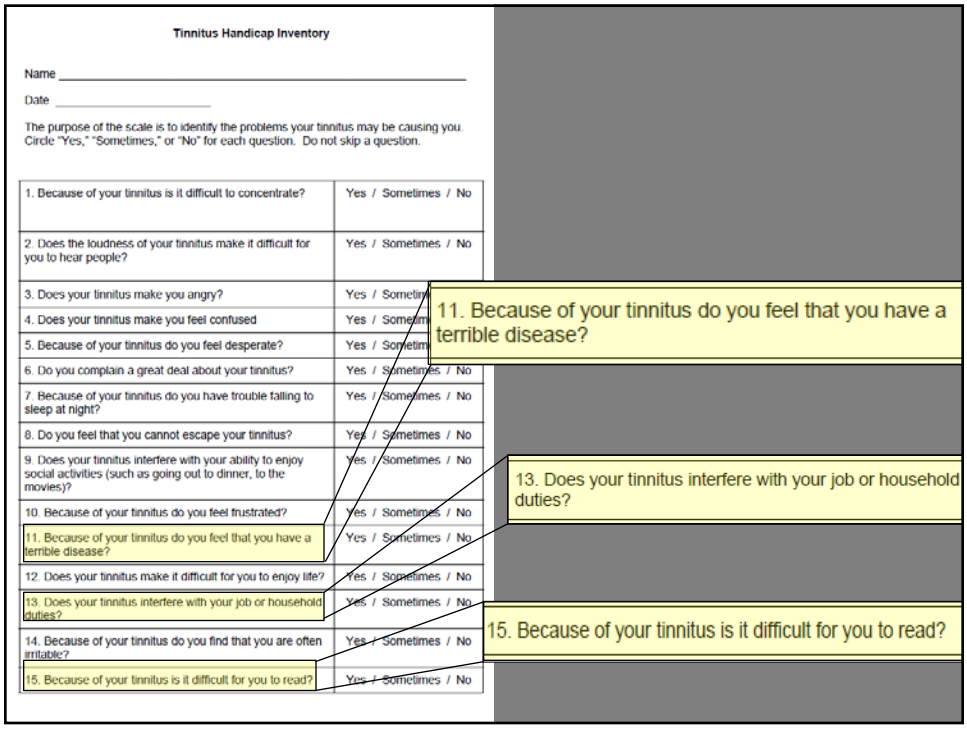
THI – Tinnitus Handicap Inventory

– 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



Tinnitus Handicap Inventory

Name _____

Date _____

The purpose of the scale is to identify the problems your tinnitus may be causing you. Circle "Yes," "Sometimes," or "No" for each question. Do not skip a question.

1. Because of your tinnitus is it difficult to concentrate?	Yes / Sometimes / No
2. Does the loudness of your tinnitus make it difficult for you to hear people?	Yes / Sometimes / No
3. Does your tinnitus make you angry?	Yes / Sometimes / No
4. Does your tinnitus make you feel confused	Yes / Sometimes / No
5. Because of your tinnitus do you feel desperate?	Yes / Sometimes / No
6. Do you complain a great deal about your tinnitus?	Yes / Sometimes / No
7. Because of your tinnitus do you have trouble falling to sleep at night?	Yes / Sometimes / No
8. Do you feel that you cannot escape your tinnitus?	Yes / Sometimes / No
9. Does your tinnitus interfere with your ability to enjoy social activities (such as going out to dinner, to the movies)?	Yes / Sometimes / No
10. Because of your tinnitus do you feel frustrated?	Yes / Sometimes / No
11. Because of your tinnitus do you feel that you have a terrible disease?	Yes / Sometimes / No
12. Does your tinnitus make it difficult for you to enjoy life?	Yes / Sometimes / No
13. Does your tinnitus interfere with your job or household duties?	Yes / Sometimes / No
14. Because of your tinnitus do you find that you are often irritable?	Yes / Sometimes / No
15. Because of your tinnitus is it difficult for you to read?	Yes / Sometimes / No

11. Because of your tinnitus do you feel that you have a terrible disease?

13. Does your tinnitus interfere with your job or household duties?

15. Because of your tinnitus is it difficult for you to read?

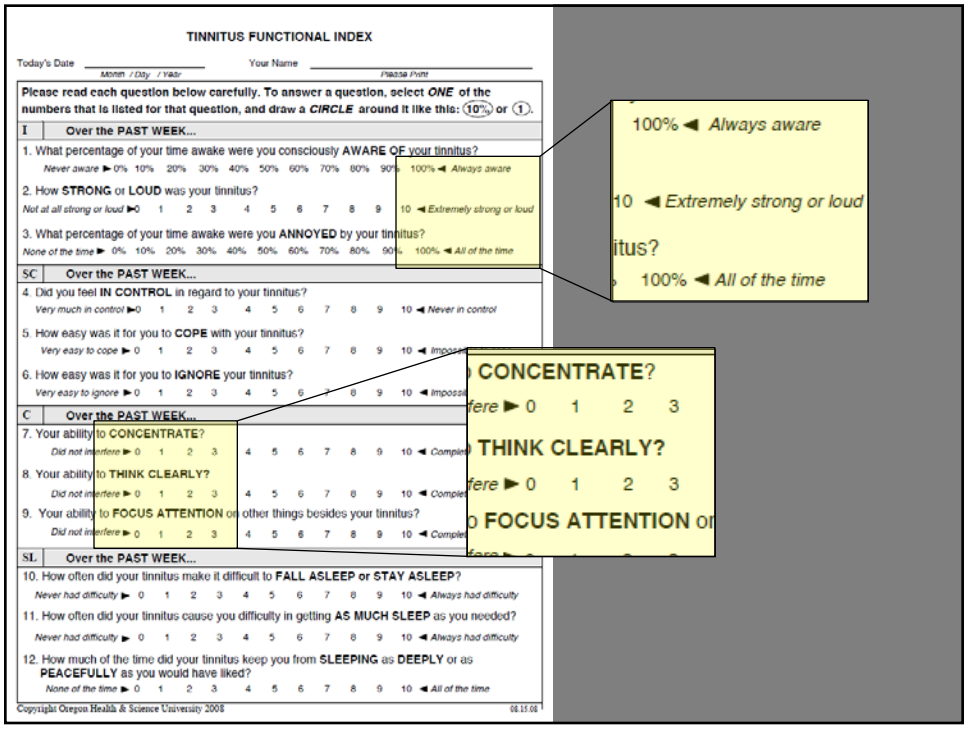
Clinical evaluation of tinnitus

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)



TINNITUS FUNCTIONAL INDEX

Today's Date _____ (Month / Day / Year) Your Name _____ (Please Print)

Please read each question below carefully. To answer a question, select *ONE* of the numbers that is listed for that question, and draw a *CIRCLE* around it like this: (10%) or (1).

I **Over the PAST WEEK...**

1. What percentage of your time awake were you consciously **AWARE** of your tinnitus?
   Never aware ► 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% ◄ *Always aware*
2. How **STRONG** or **LOUD** was your tinnitus?
   Not at all strong or loud ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Extremely strong or loud*
3. What percentage of your time awake were you **ANNOYED** by your tinnitus?
   None of the time ► 0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100% ◄ *All of the time*

SC **Over the PAST WEEK...**

4. Did you feel **IN CONTROL** in regard to your tinnitus?
   Very much in control ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Never in control*
5. How easy was it for you to **COPE** with your tinnitus?
   Very easy to cope ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Impossi*
6. How easy was it for you to **IGNORE** your tinnitus?
   Very easy to ignore ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Impossi*

C **Over the PAST WEEK...**

7. Your ability to **CONCENTRATE**?
   Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Complet*
8. Your ability to **THINK CLEARLY**?
   Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Complet*
9. Your ability to **FOCUS ATTENTION** on other things besides your tinnitus?
   Did not interfere ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Complet*

SL **Over the PAST WEEK...**

10. How often did your tinnitus make it difficult to **FALL ASLEEP** or **STAY ASLEEP**?
    Never had difficulty ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Always had difficulty*
11. How often did your tinnitus cause you difficulty in getting **AS MUCH SLEEP** as you needed?
    Never had difficulty ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *Always had difficulty*
12. How much of the time did your tinnitus keep you from **SLEEPING** as **DEEPLY** or as **PEACEFULLY** as you would have liked?
    None of the time ► 0 1 2 3 4 5 6 7 8 9 10 ◄ *All of the time*

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100% ◄ *Always aware*

10 ◄ *Extremely strong or loud*

itus?

100% ◄ *All of the time*

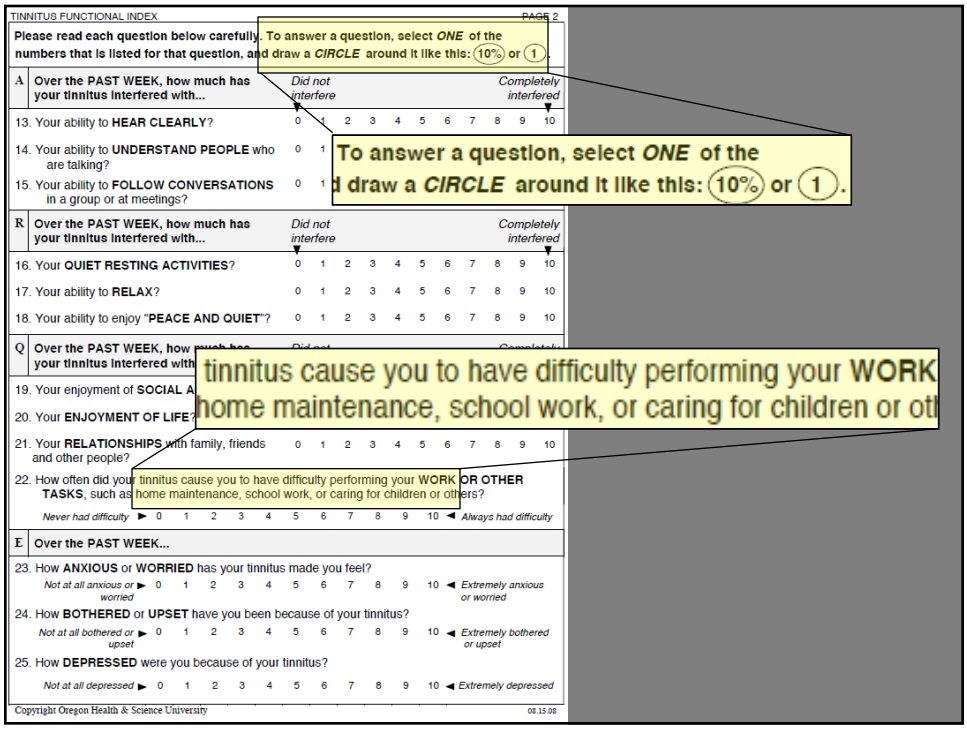
CONCENTRATE?

fere ► 0 1 2 3

THINK CLEARLY?

fere ► 0 1 2 3

FOCUS ATTENTION or



Clinical evaluation of tinnitus

Survey	Responses	Subscales	Scoring
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

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)**

Gilles, et al. (2012). *Prevalence of leisure noise-induced tinnitus and the attitude toward noise in university students*. Otology & Neurotology. 33:899-906

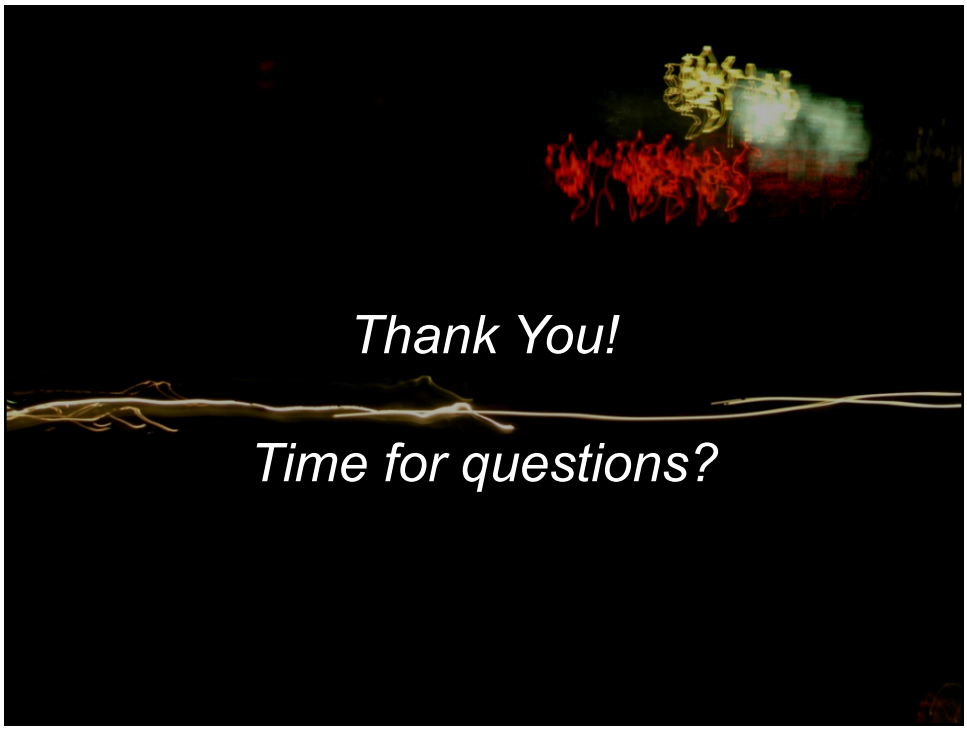
Clinical evaluation of tinnitus

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



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