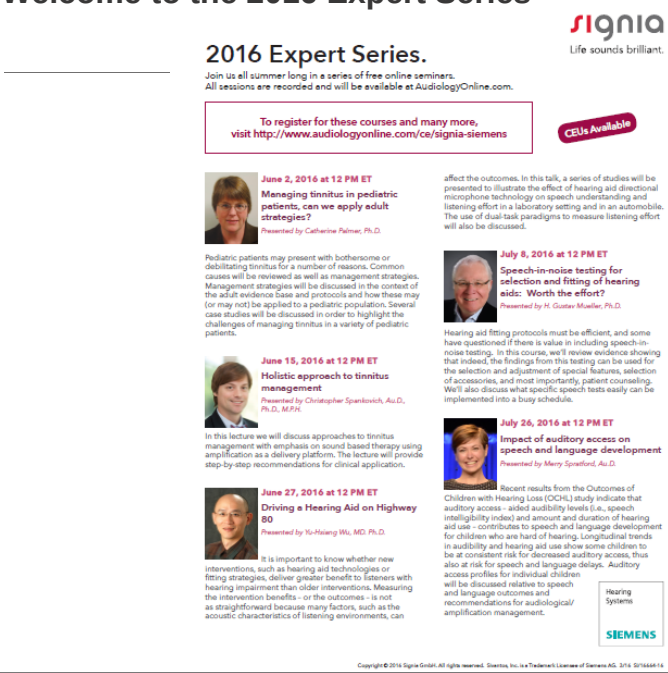
Welcome to the 2016 Expert Series



2016 Expert Series.

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CEUs Available

June 2, 2016 at 12 PM ET
Managing tinnitus in pediatric patients, can we apply adult strategies?
Presented by Catherine Palmer, Ph.D.

Pediatric patients may present with bothersome or debilitating tinnitus for a number of reasons. Common causes will be reviewed as well as management strategies. Management strategies will be discussed in the context of the adult evidence base and protocols and how these may (or may not) be applied to a pediatric population. Several case studies will be discussed in order to highlight the challenges of managing tinnitus in a variety of pediatric patients.

June 15, 2016 at 12 PM ET
Holistic approach to tinnitus management
Presented by Christopher Spankovich, Au.D., Ph.D., M.P.H.

In this lecture we will discuss approaches to tinnitus management with emphasis on sound based therapy using amplification as a delivery platform. The lecture will provide step-by-step recommendations for clinical application.

June 27, 2016 at 12 PM ET
Driving a Hearing Aid on Highway 80
Presented by Yu-Hsiang Wu, MD. Ph.D.

It is important to know whether new interventions, such as hearing aid technologies or fitting strategies, deliver greater benefit to listeners with hearing impairment than older interventions. Measuring the intervention benefits - or the outcomes - is not as straightforward because many factors, such as the acoustic characteristics of listening environments, can affect the outcomes. In this talk, a series of studies will be presented to illustrate the effect of hearing aid directional microphone technology on speech understanding and listening effort in a laboratory setting and in an automobile. The use of dual-task paradigms to measure listening effort will also be discussed.

July 8, 2016 at 12 PM ET
Speech-in-noise testing for selection and fitting of hearing aids: Worth the effort?
Presented by H. Gustav Mueller, Ph.D.

Hearing aid fitting protocols must be efficient, and some have questioned if there is value in including speech-in-noise testing. In this course, we'll review evidence showing that indeed, the findings from this testing can be used for the selection and adjustment of special features, selection of accessories, and most importantly, patient counseling. We'll also discuss what specific speech tests easily can be implemented into a busy schedule.

July 26, 2016 at 12 PM ET
Impact of auditory access on speech and language development
Presented by Merry Spratford, Au.D.

Recent results from the Outcomes of Children with Hearing Loss (OCHL) study indicate that auditory access - aided audibility levels (i.e., speech intelligibility index) and amount and duration of hearing aid use - contributes to speech and language development for children who are hard of hearing. Longitudinal trends in audibility and hearing aid use show some children to be at consistent risk for decreased auditory access, thus also at risk for speech and language delays. Auditory access profiles for individual children will be discussed relative to speech and language outcomes and recommendations for audiological/ amplification management.

Hearing Systems
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Holistic approach to tinnitus management

Dr. Christopher Spankovich

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Hearing Systems
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Course Objectives

1. After this course, participants will be able to apply knowledge of modern tinnitus theory to patient counseling.

2. After this course, participants will be able to describe sound therapy based management options.

3. After this course, participants will be able to incorporate a 5 step tinnitus management approach to clinical application.

Introducing Dr. Christopher Spankovich

signia
Life sounds brilliant.

Tinnitus: Holistic Approach to Management

Christopher Spankovich, AuD, PhD, MPH
Associate Professor & Director of Clinical Research
Department of Otolaryngology & Communicative Sciences

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Conflicts of Interest

- **I work for the UMMC**
- **Editorial Advisor of AT**
- **No affiliation with a specific manufacturer**
- **Receive a small honorarium for this lecture**

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Types of Tinnitus

- **Objective/Somatosound**
  - Pulsatile (often cardiovascular)
  - Clicking (often myoclonic)
- **Subjective/Neurophysiological/Sensorineural**
  - More common form associated with numerous sound experiences and unable to currently be measured objectively
  - We will focus on this type!

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Approaches Overview

- Numerous approaches to tinnitus have been developed over the past few decades
  - Sound therapies (Many variations with and without counseling)
  - CBT influenced Counseling (Many contributors)
    - Tinnitus Activities Treatment (Tyler and colleagues)
    - Integrated Approach to Tinnitus Patient Management (Sweetow and colleagues)
  - Tinnitus Retraining Therapy (Jastreboff and colleagues)
  - Progressive Tinnitus Management (Henry and colleagues)
  - Patient Centered Therapy (Acceptance of tinnitus as part of me (Mohr and colleagues)
  - Mindfulness based tinnitus stress reduction (Gans)
  - Combination of the above or modified approaches (Many others)

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Approaches Overview

- Though there are philosophical difference in these approaches, they also have a great deal in common.
  - Counseling of some type: Common
  - Sound therapy of some type: Common
  - None treat tinnitus, but rather the reaction to tinnitus
  - Some potential differences are the areas emphasized in counseling, perspectives of directive vs collaborative interaction with patient, idea of classical conditioning vs. operant conditioning, and level setting and type of sound for sound therapy

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5 Point Holistic Approach

- Source: Counsel
- Habituation & Cognitive Restructuring: Counsel
- Sound Therapy: Treatment
- Distraction: Treatment
- Diet, Exercise, and Sleep: Treatment

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Step by Step

- **Medical Evaluation**
- **History** and Structured Interview to direct assessment and counseling
- **Inventories to direct counseling (TFI, THI, TRQ, and etc.)**
- **Go over Game Plan!**
- **Assessment (audio, tinnitus eval, and etc)**
- **5 Point Holistic Approach**
  - **Holistic meaning comprehensive whole person not pseudoscience**

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5 Point Holistic Approach

- Source: Counsel
- Habituation: Counsel
- Sound Therapy: Treatment
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- Diet, Exercise, and Sleep: Treatment

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Tinnitus Theory

Peripheral

- Hair Cell
  - OHC & OAEs
- Auditory Nerve
  - Spontaneous Rate
  - Change in neural afferent potentiation
- Other neural
  - Imbalance of afferent and efferent input

Central

- Hyperactivity/increased spontaneous activity
- Bursting & synchronized activity
- Imbalance in inhibitory function (e.g. GABA)
- Reorganization of mapping
- Multisensory input
- Ephaptic transmission
- Limbic System
- Dysfunctional Gating
- Gamma and alpha waves

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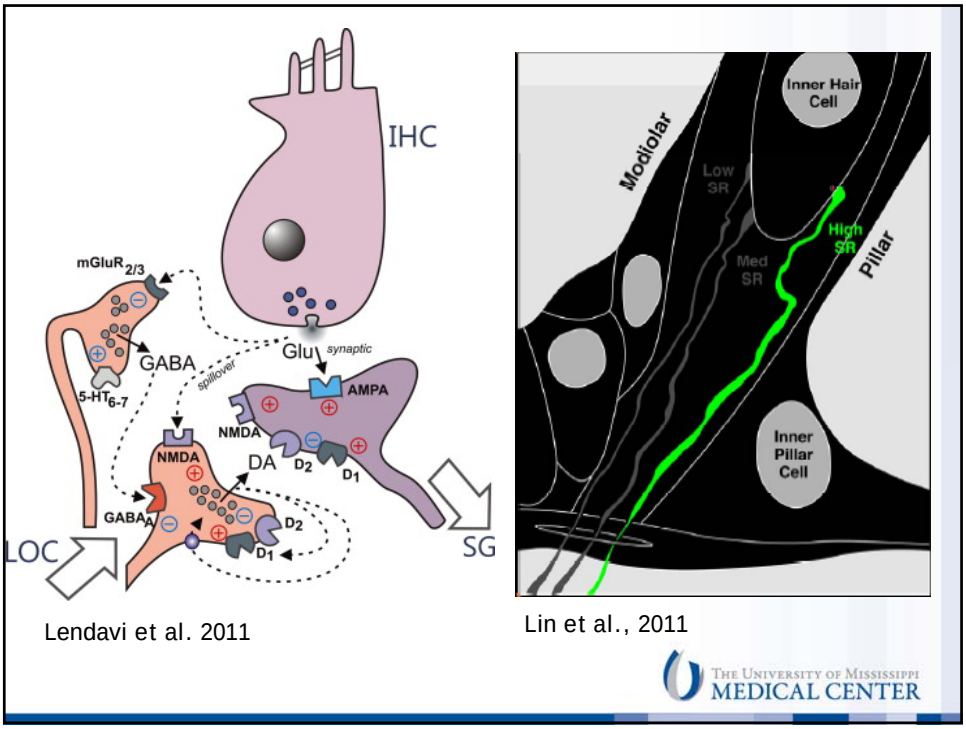
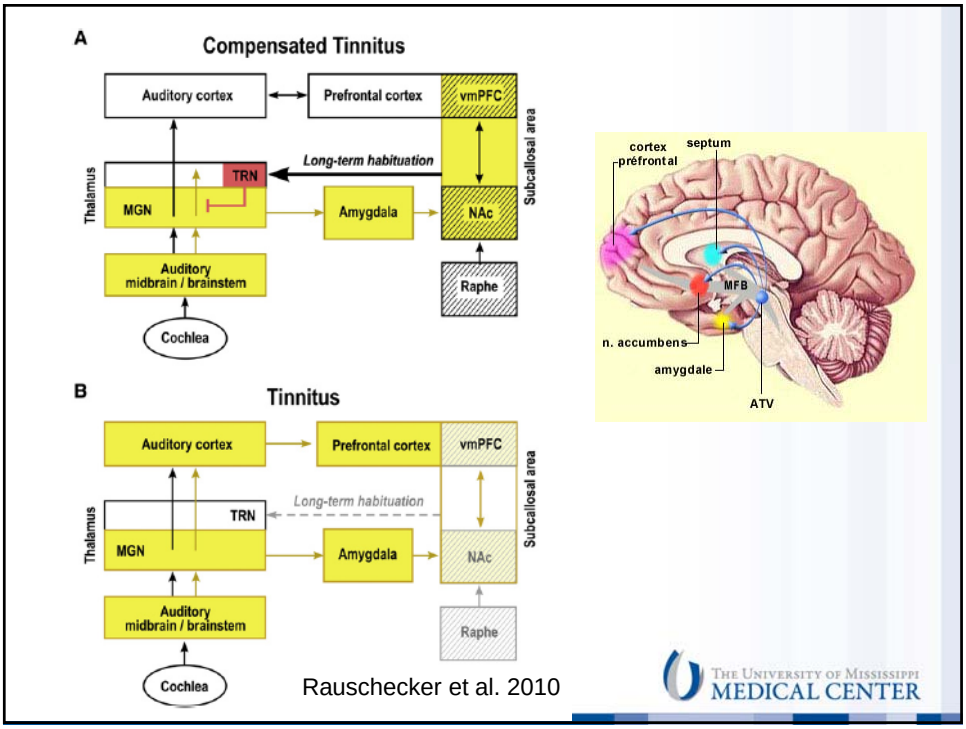


Lendavi et al. 2011

Lin et al., 2011



Rauschecker et al. 2010

Source

- Tinnitus is a spectrum based percept, most commonly a consequence of changes in auditory and nonauditory neural networks following damage to the cochlea. Homeostatic compensatory mechanisms occur after hearing loss and these mechanisms alter the balance of excitatory and inhibitory neurotransmitters. In many individuals with hearing loss, chronic tinnitus and related phenomena emerge. Some people with tinnitus are disturbed by this subjective sensation. When auditory network dysfunction is coupled with limbic-gating dysfunction, an otherwise meaningless auditory percept such as tinnitus may acquire negative emotional features.
- Ryan & Bauer (2016). Neuroscience of Tinnitus, Neuroimaging Clin N Am, 26 (2), 187-196.

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Counseling: How to Introduce Source Theory

- Do your homework: read!
- What to discuss with patient?
  - Normal Auditory System
  - Hearing Loss
  - Causes of Tinnitus
  - Transient Ear Noise
  - Tinnitus Neuroscience

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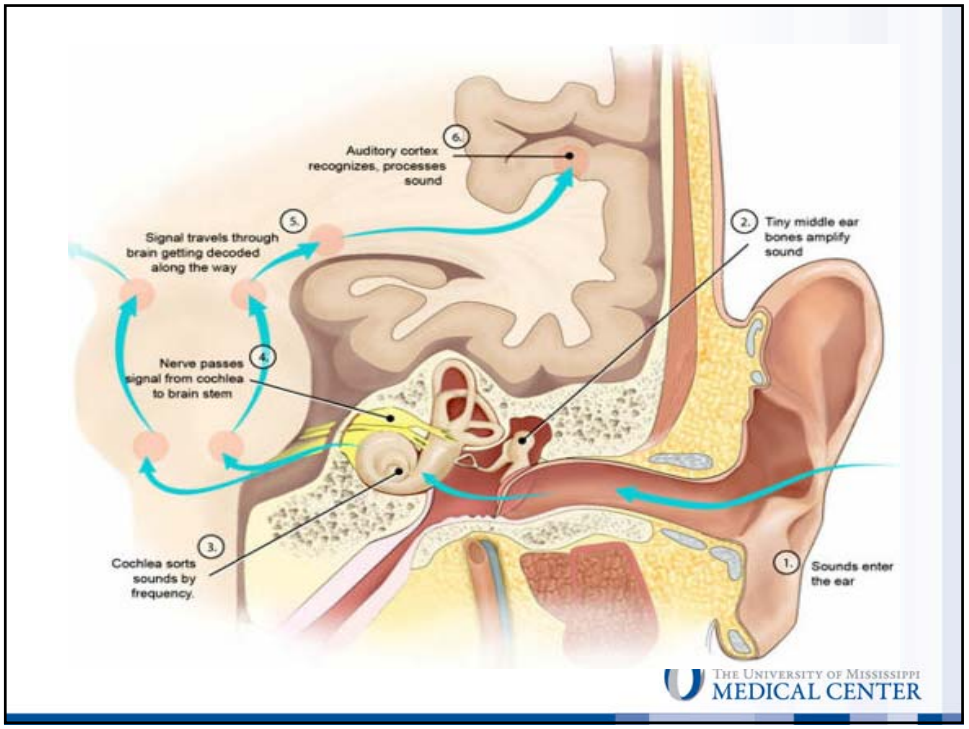
6. Auditory cortex recognizes, processes sound
5. Signal travels through brain getting decoded along the way
2. Tiny middle ear bones amplify sound
4. Nerve passes signal from cochlea to brain stem
3. Cochlea sorts sounds by frequency.
1. Sounds enter the ear
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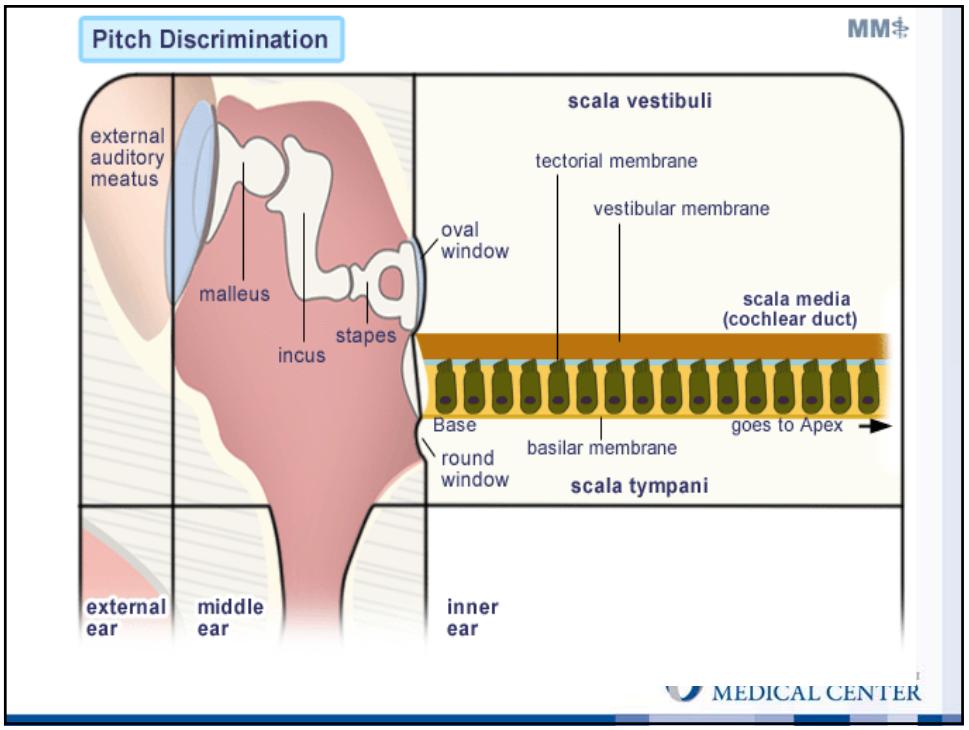
Pitch Discrimination
MM
scala vestibuli
external auditory meatus
tectorial membrane
vestibular membrane
oval window
malleus
scala media (cochlear duct)
stapes
incus
Base
goes to Apex
basilar membrane
round window
scala tympani
external ear
middle ear
inner ear
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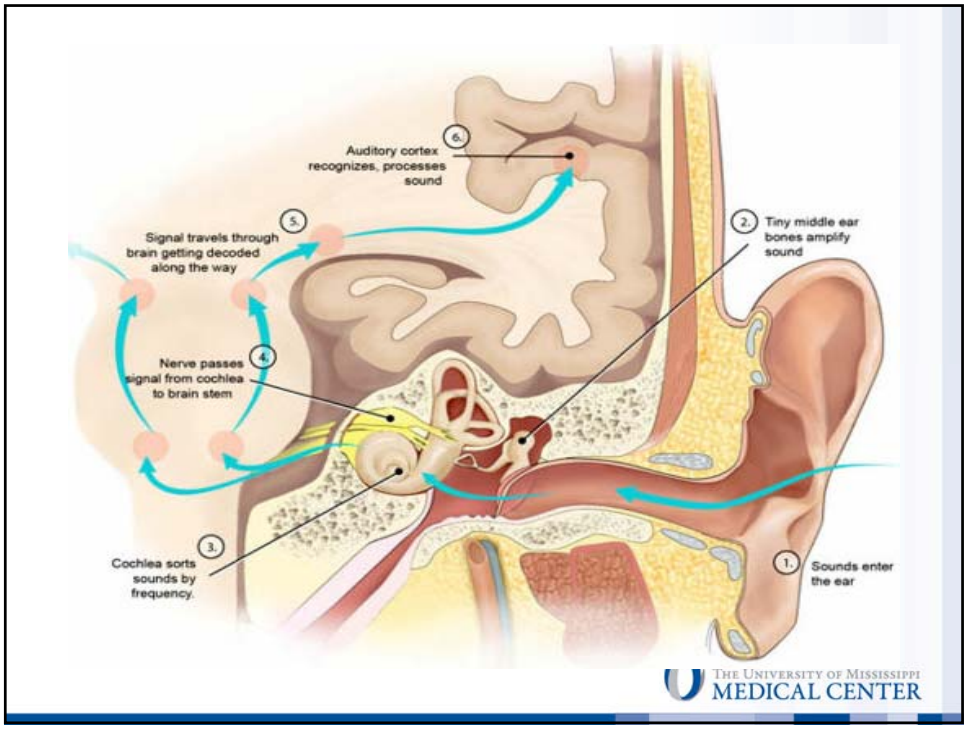
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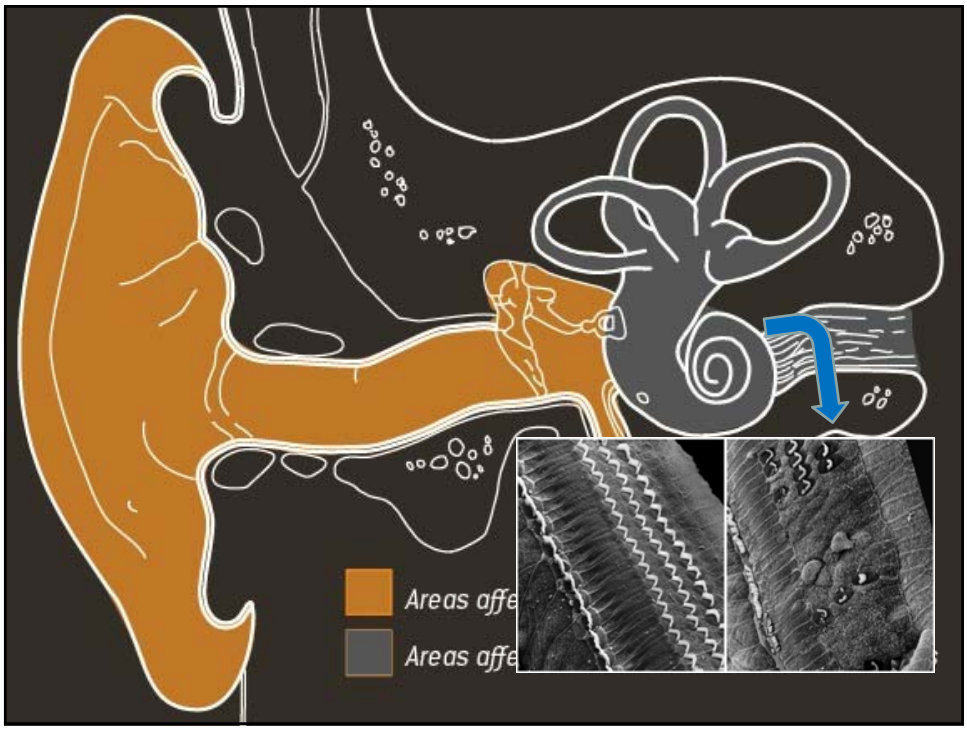
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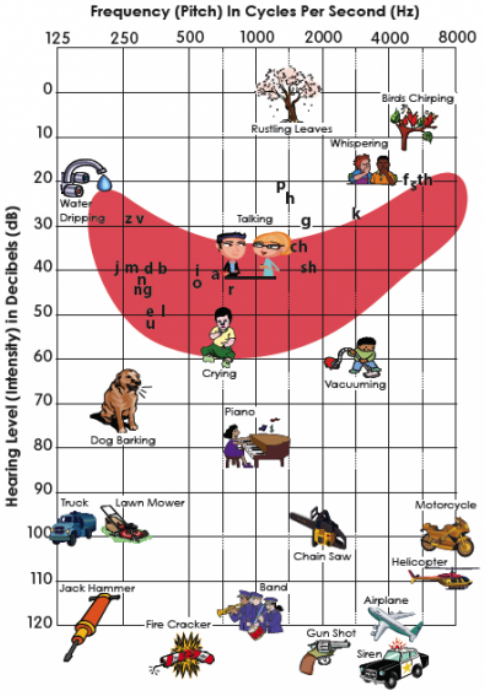

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Summary on Hearing and Hearing Loss

- We hear with our brain not our ears
- The most common type of hearing loss is high frequency sensorineural hearing loss
- When hearing loss occurs are brain changes (neural plasticity) to try to compensate
  - This can result in ?

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Tinnitus Theory for Patient

- What causes tinnitus?
  - Early theories suggested everyone has tinnitus!
  - Heller and Bergman (1953)
  - Ear-lids?
  - Radio Analogy

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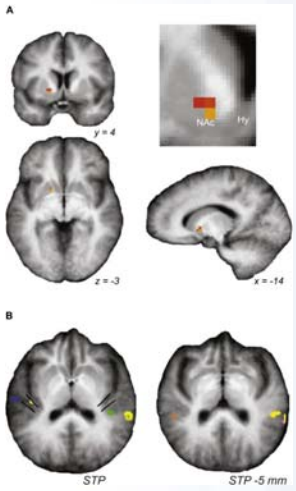
Tinnitus Theory for Patient

- What causes tinnitus?
  - More recent research using imaging
  - Tinnitus Modulation (gaze, cutaneous)
  - Auditory and Non-auditory regions implicated
    - Attention/Salience
    - Memory
    - Emotion/Stress



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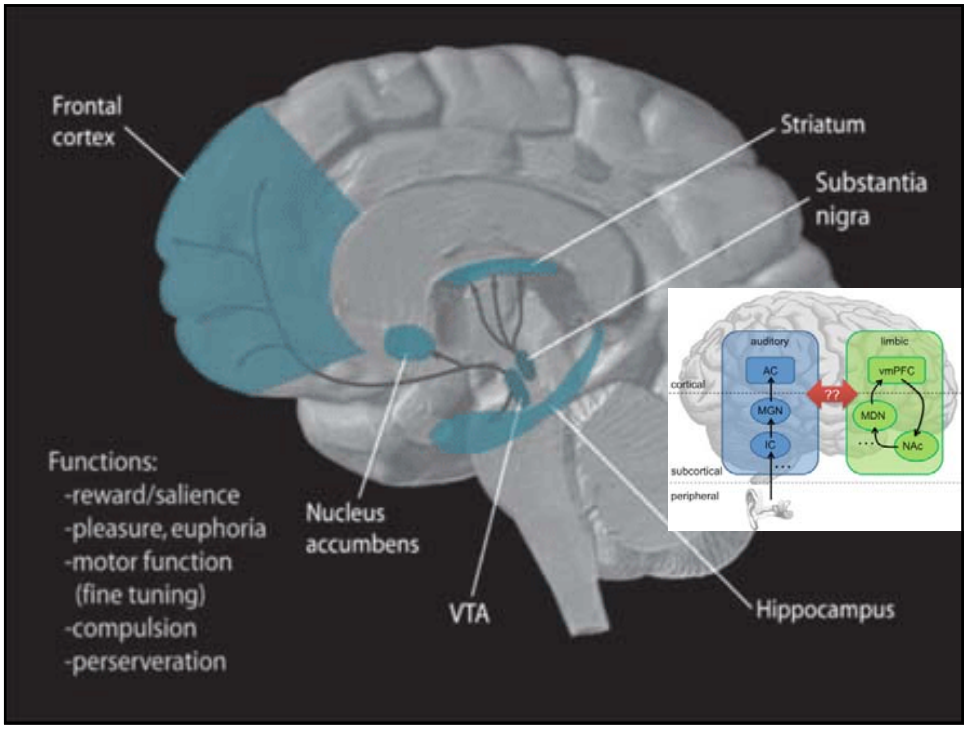
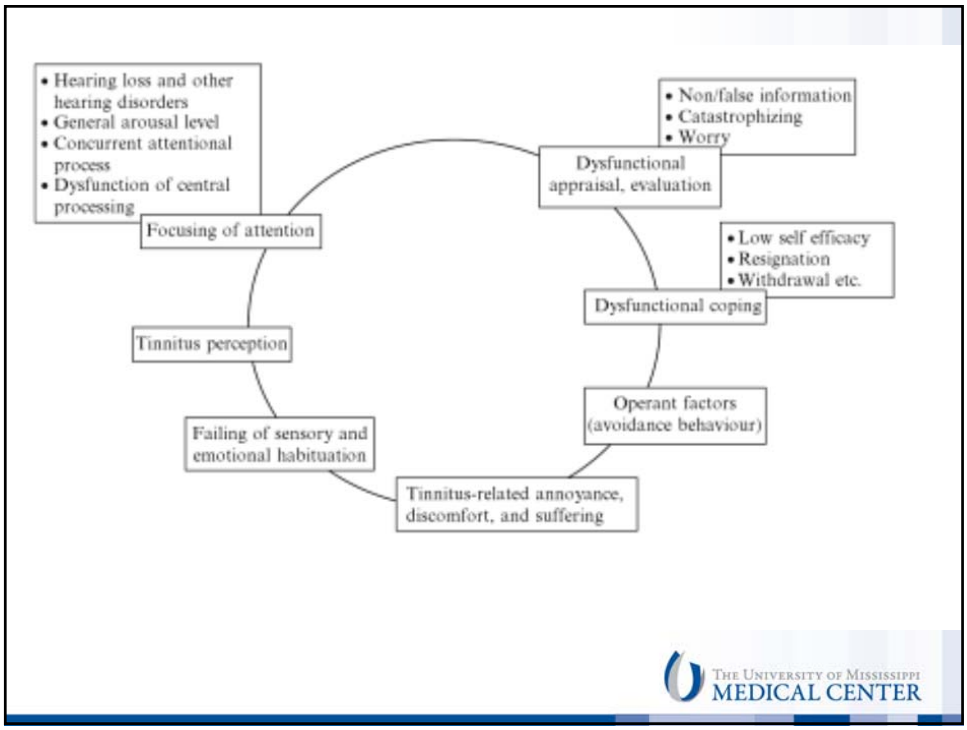

Frontal cortex
Striatum
Substantia nigra
Functions:
-reward/salience
-pleasure, euphoria
-motor function (fine tuning)
-compulsion
-perserveration
Nucleus accumbens
VTA
Hippocampus
auditory
limbic
AC
vmPFC
cortical
??
MGN
MDN
IC
NAc
subcortical
peripheral


• Hearing loss and other hearing disorders
• General arousal level
• Concurrent attentional process
• Dysfunction of central processing
Focusing of attention
Tinnitus perception
Failing of sensory and emotional habituation
Tinnitus-related annoyance, discomfort, and suffering
Operant factors (avoidance behaviour)
Dysfunctional coping
• Low self efficacy
• Resignation
• Withdrawal etc.
Dysfunctional appraisal, evaluation
• Non/false information
• Catastrophizing
• Worry
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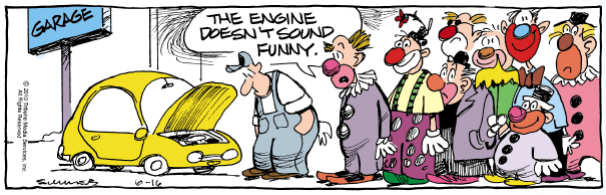
Non-Auditory Factors

- Tinnitus and Limbic Response
  - **Makes sense for brain to view as an alarm**
    - Normal reaction to not like
  - Car Engine Analogy (e.g., breathing)
  - Visiting Friend Analogy



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Source Summary

- Likely numerous contributions at various levels of system
- What to take away
  - Tinnitus is a side effect of neural change as a result of damage to hearing or other neural insult
  - This neural change results in a signal that is being interpreted in the brain as sound when no external sound is present
  - Tinnitus is not likely one single physiological disruption but involves both auditory and nonauditory regions of the brain

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5 Point Approach

- Source: Counsel
- **Habituation and Cognitive Restructuring: Counsel**
- Sound Therapy: Treatment
- Distraction: Treatment
- Diet, Exercise, and Sleep: Treatment

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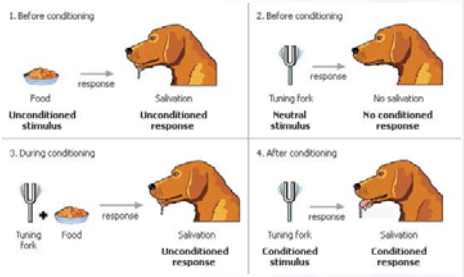
Habituation

- Brain does this all the time
- Can do the same with sound
  - Airport
  - Train
  - Clock
  - Air conditioning, fan, etc.
- Sound is subjective
- Definition of conditioning



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Cognitive Restructuring

- Identify and correct maladaptiv thoughts and behaviors
- What is the patient's perceptio of tinnitus
- Do they display cognitive distortions: e.g. all or none thinking, jumping to conclusion disqualifying positive
- Help identify alternative thoug and behaviors
- For example, patient stops going to concerts because of tinnitus

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5 Point Approach

- Source: Counsel
- Habituation: Counsel
- **Sound Therapy: Treatment**
- Distraction: Treatment
- Diet, Exercise, and Sleep: Treatment

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Tinnitus Treatment

- **How do we Treat?**
  - Reduce emotional Response
    - Sound Therapy (Masker, Sound generator, hearing aid, Neuromonics, Sound Cure, CR Neuromodulation, cochlear implant)
    - Cognitive Behavioral Therapy
    - Pharmacological (antidepressants, anti-migraine)
  - Reduce Contrast and Suppress Hyperactivity
    - Sound Therapy (same as above)
    - Pharmacological (anti-seizure meds)
  - Disrupt source
    - VNS, Deep brain stimulation, Sound stimulation

(Sweetow 2010)

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Tinnitus Treatment

- **SOUND THERAPY**
  - Masking (cover up)
  - Tinnitus Retraining Therapy (habituate by reduced reaction and perception)
    - Sound Generators or Noisers
  - Neuromonics (program uses music preconditioning stage and active stage)
  - Okamoto Notch Music
  - Sound Cure (Modulated tones)
  - CR Neuromodulation
  - Levo System (similar to Sound Cure)
  - Phase Inversion
  - **Amplification**

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Tinnitus Treatment

- **SOUND THERAPY (General Tips)**
  - Silence is not your friend, have sound around you, do not mask, but mix
    - Where to start: Envrionmental sounds, white noise player, MP3 player, CD player, Apps, etc.
    - Play sound as much as possible, but at least several hours per day, should mix with tinnitus
    - You can download online for free from ATA website, also purchase from amazon.com, itunes, there are even apps for 99 cents.

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Tinnitus Treatment

- **SOUND THERAPY**
  - What kind of Sound??????
    - White noise, pink noise, modulated, music
    - Continuous (ocean, rain, white noise, pink noise, and etc)
    - Meaningless but relaxing (not actively listen)
    - Do not use a bothersome sound

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Tinnitus Treatment

- **SOUND THERAPY**
  - What kind of Sound??????
    - What is the benefit of shaping sound to tinnitus?
    - What level
      - Cover perception (masking/suppression)
      - Mixing level (TRT)
      - Softest level to achieve relief (TAT)
      - Other

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Tinnitus Treatment

- **AMPLIFICATION** (Searchfield et al., 2010; Parrazzini et al., 2011; McNeill et al., 2012)
  - Kochkin et al. (2011)-Hearing aids provided substantial tinnitus relief in 34% of patients
    - Enriched soundscape
    - Partial masking of Tinnitus
    - Reduced listening fatigue
    - Change focus of treatment
    - Linear octave frequency transposition (Peltier et al., 2012)
    - **WHAT IS YOUR PATIENTS PRIMARY COMPLAINT?**
      - Very common, “I can’t hear because of the tinnitus”

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Tinnitus Treatment

- AMPLIFICATION
  - If you have a hearing loss and tinnitus, hearing aids with a combo sound generator (noiser) are very effective, WHY?
    - Stimulate the pathways that are contributing to tinnitus
    - Turns the lights back on!
    - At same time be able to provide constant noise for retraining, should be set so mixes with tinnitus (can't habituate to what can't perceive)
    - Set it and forget it!
    - Move focus of treatment from tinnitus to auditory system and hearing loss

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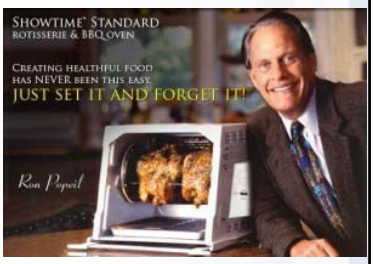
Amplification and Individualized Tx

- Keep it simple!
  - Recommend: mic + sound therapy in most situations as much of the day possible
  - Patient control: Prefer to set at level in the office, mixing point and leave. Don't want them constantly adjusting and bringing attention back to tinnitus. But depends on patient!
  - Remind patient we don't want them to monitor the treatment (though they will at first) but set and forget!
  - Wear at least 8 hrs per day and use sound therapy at night in bedroom (e.g. soundpillow)



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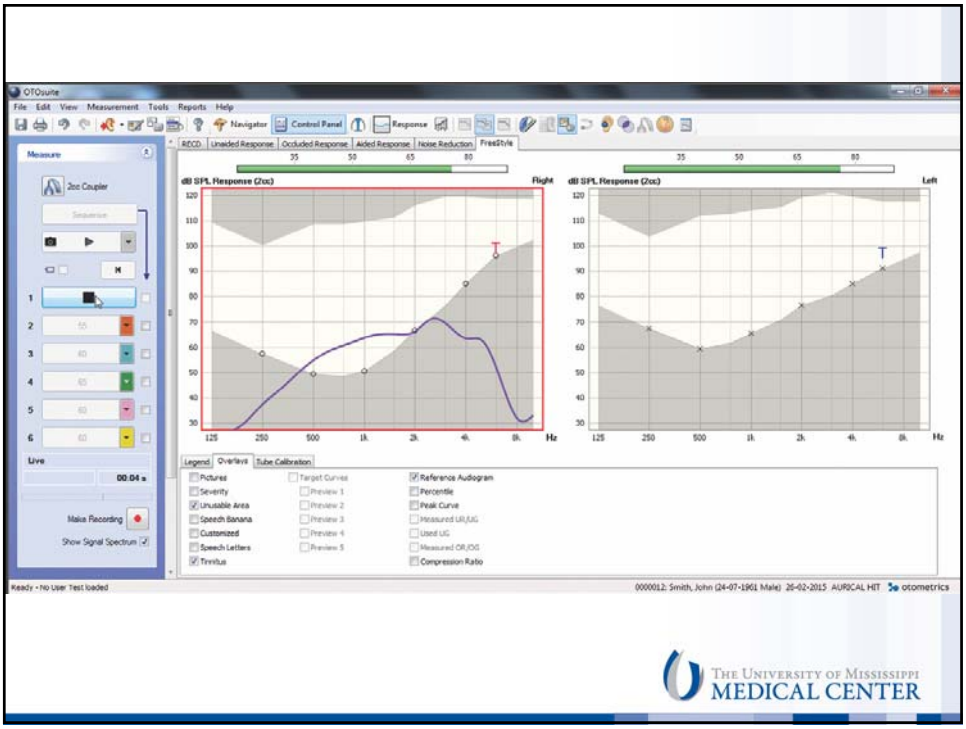
Amplification and Individualized Tx



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	Tinnitus Feature Name/HA Models	Interesting Features	App Available?	App Features
Widex	Zen / Dream	Fractal "color" programs, reputation	No	n/a
GN ReSound	TSG & nature sounds/Linx2, Enzo, (Verso & Alero w/ phone clip)	6 nature sounds, "mixer" feature	Yes, Apple only	No steamer needed to track progress, bubbles calming experience
Starkey	Multiflex Tinnitus/ Z Series and Xino (RICs only)	16 bands of frequency adjustment	Yes, Apple & Android	No streamer needed. Soundpoint fitting, Target match
Phonak	Tinnitus Balance/ Bolero, Audeo	Can be used with com accessories, headphone or sound pillows	Yes, Apple & Android	No streamer needed calming exercises
Signia/Sivantos	Tinnitus Therapy Feature/ All current models	Ocean waves sound, up to 20 bands	Yes, Apple & Android	No streamer needed, adjust mic or therapy signal level
Oticon	Sound Support/ Alta2, Nera2, Ria2 Pro TI models	Ocean sounds	Yes, Apple	Uses streamer, can use sounds from own music library

Table 1. Comparison of hearing instruments with tinnitus features.

Young et al (2016)

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Amplification and Individualized Tx

- Sound therapy summary
  - Keep it simple
  - Don't forget the therapy part
  - Once they reduce perception of time aware of tinnitus and annoyance significantly, reduce the level of the sound therapy one perceptual notch

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5 Point Approach

- Source: Counsel
- Habituation and Cognitive Restructuring: Counsel
- Sound Therapy: Treatment
- **Distraction: Treatment**
- Diet, Exercise, and Sleep: Treatment

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Tinnitus

- **DISTRACTION**
  - When you notice or bothered do something positive!
  - Try not to actively engage the tinnitus
    - I can't just tell you not to think about it

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Whatever you do, do not think of a number right now!

7
3
4
?

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5 Point Approach

- Source: Counsel
- Habituation: Counsel
- Sound Therapy: Treatment
- Distraction: Treatment
- **Diet, Exercise, and Sleep: Treatment**

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Tinnitus

- SLEEP HYGIENE
  - **Sleep is critical**,
    - No Naps, Bedroom = Sleep, Exercise (but not right before bed), Healthy Diet
    - Sound Pillow
    - Melatonin (run by physician)

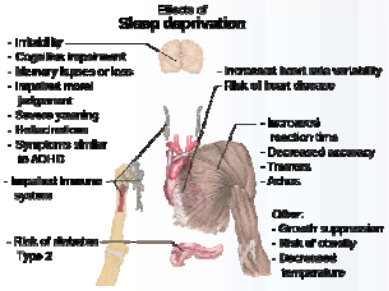

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Table 3

Sleep Hygiene

- Try to maintain a regular bedtime and waking time, even on weekends.
- Avoid napping.
- Use the bedroom only for sleep or sexual activity.
- Keep the bedroom environment cool, quiet, and dark. Avoid bright-light exposure during the night.
- Develop a relaxing bedtime routine. Avoid strenuous exercise or stressful activities before bedtime.
- Do not drink caffeine-containing beverages after noon; eliminate them if possible.
- Avoid heavy meals just before bedtime, a light bedtime snack may be helpful.
- Reduce fluid intake for several hours before bedtime to decrease the need to urinate during the night.
- Regular exercise, particularly during the late afternoon or early evening, may help to promote sleep. A hot bath or sauna at least several hours before bedtime may also be helpful.
- Avoid alcohol or nicotine use prior to bedtime.
- Turn the clock face away and do not check the time if you wake up at night.

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Tinnitus

- BE ACTIVE
  - Physical activity associated with lower levels of tinnitus severity (Carpenter-Thompson et al. 2015)
  - Adolescents and adults with higher physical activity were less likely to report tinnitus (Loprinzi et al. 2013)

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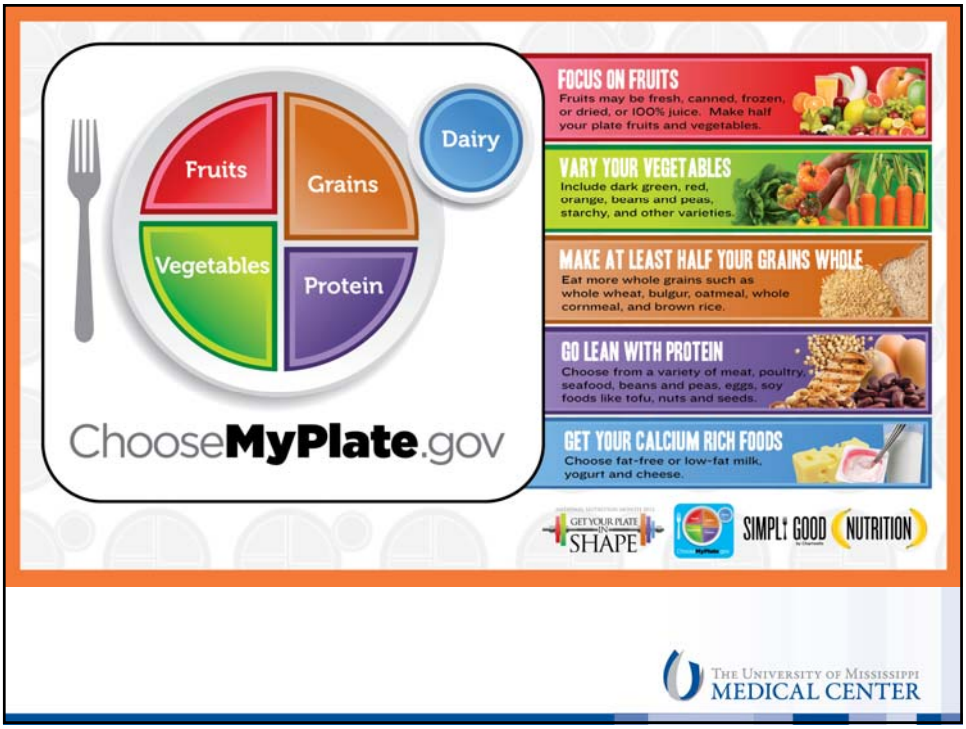

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Tinnitus

- **HEALTHY DIET**
  - Health living-Diet and Exercise (get physician approval)
  - Eat healthy-Nutrient Dense: diet rich in green leafy vegetables, onions, mushroom, broccoli, berries, seed & nuts, tomatoes, colored veggies, Eat much as you want!
  - Make protein your side dish: grass fed beef and skinless chicken breast

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Tinnitus

- **HEALTHY DIET**
  - Avoid: fried food, processed foods (including deli meats), reduce dairy intake, and reduce white foods (white flour, white rice, white pasta, white potatoes, white sugar)
  - Basically eat lots of whole fruits and veggies, reduce high glycemic index foods
  - Eat good amount of protein but not too much!
  - TALK WITH A NUTRIONIST/DIETITIAN

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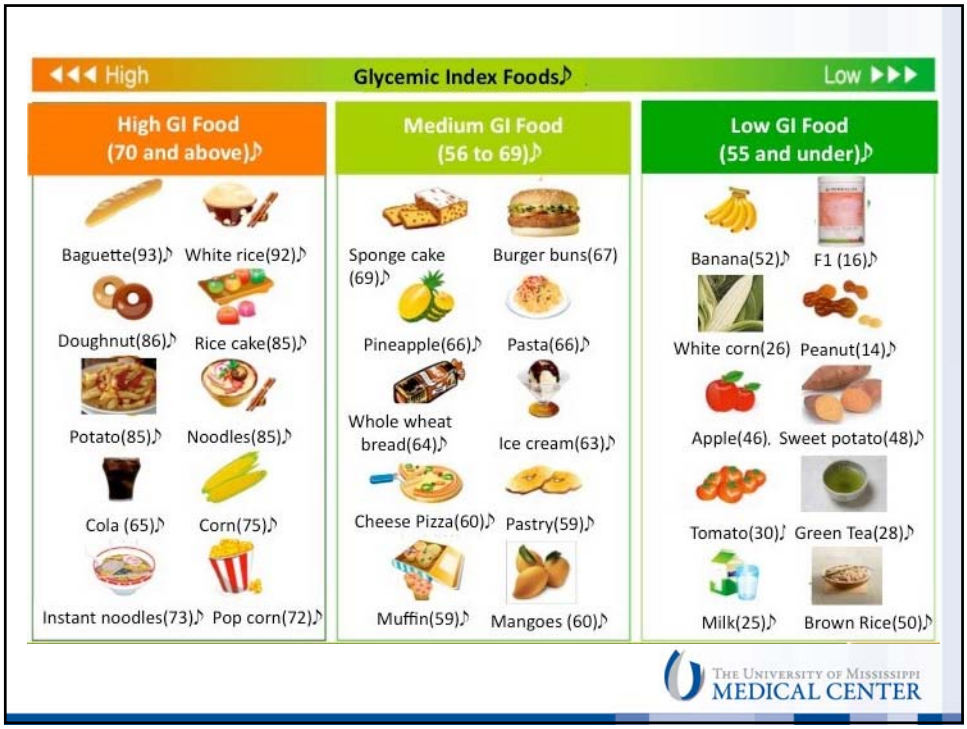

Tinnitus & NHANES

- 2176 participants from 1999-2002
- HEI and reported tinnitus
- Weightings & Strata applied
- Adjusted for age, sex, race, education, smoking, noise exposure, diabetes, hypertension, and hearing loss
  - 3 Models

Model for Overall HEI	F	Sig.	F-adjusted	Sig.
1 (Persistent Tinnitus)	5.042	.033		
2 (Persistent Tinnitus + age, sex, race, education diabetes, hypertension, smoking, noise, veteran/military)	8.898	<.001	4.389	.045
3 (1+2+ High and Low Freq PTA)	9.635	<.001	2.521	.123

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The other Holistic

- Supplements, essential oils, acupressure/acupuncture, etc.
  - No evidence to support effectiveness to treat tinnitus, not a cure for tinnitus
  - Educate patient on lack of scientific support, role of placebo effect and let them make their own educated decision
  - Reductions in stress and anxiety can help with tinnitus

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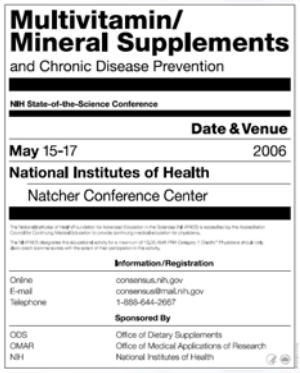
Magic Pill

- Iowa Women's Health Study (2011)
- Men's SELECT Study (2011)
- Chronic vs. Acute Prevention
- http://www.nytimes.com/2013/06/09/opinion/sunday/dont-take-your-vitamins.html?pagewanted=all&_r=0


Multivitamin/ Mineral Supplements
and Chronic Disease Prevention

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Tinnitus: CBT/DBT

- **Can be very helpful even without sound therapy**
  - Relaxation techniques
    - Breathing and Imagery (see ATA website)
    - Yoga, Tai Chi
  - Other adjunctive therapy, e.g. Cognitive Behavioral Therapy
    - Tinnitus and Depression/Anxiety?
    - Hyperarousal
  - Do not make tinnitus a central part of your life, it shouldn't be
    - Internet searches, chat rooms, on search for the cure!
    - How can you habituate to something you are focused on.

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Tinnitus Summary

- My Tinnitus
- Goal not to stop the tinnitus, but to diminish perception and response
- Tinnitus should not prevent you from enjoying life, if it is, then other therapy such as cognitive behavioral therapy may be helpful
- Tinnitus will fluctuate during this process
  - That is OK, use the tips and strategies and relaxed control

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Tinnitus Summary

- Tinnitus is a common side effect of hearing loss
- The response you are having is normal, it makes sense for the brain to view as an alarm
- Take a negative and turn into a positive, make the healthy lifestyle changes, use sound and distraction
- The more you are enjoying life the less time you will have to not enjoy the tinnitus
- Sound can be a treatment and an escape!
- At times you will listen for your tinnitus-like missing an old friend
  - Positive: you just went minutes, hours, days not attending, that is habituation

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Thank you

- Any questions or comments?
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Thank you Dr. Spankovich!

signia
Life sounds brilliant.