Overview:
Tinnitus Activities Treatment

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Otolaryngology

WHY IS HE SCREAMING ???

Agenda

1. Introduce Tinnitus Activities Treatment
2. Review four areas of focus in activities treatment
3. Provide information for implementing activities treatment in clinical practice
4. Hearing Aids for Tinnitus
5. Sound Therapy for Tinnitus

Background;
Tinnitus Activities Treatment

- Began in 1980s:
  - Provided informational counseling on tinnitus and related problems,
  - Suggested coping strategies
  - Recommended partial masking for tinnitus

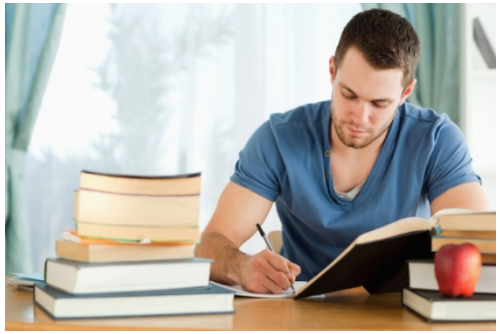
- Influenced by work of Coles, 1987; Hallam, 1989; Henry & Wilson, 2001, 2002, Sweetow, 1984; among others

Open Ended Questionnaire

(Tyler & Baker, 1983)

List problems tinnitus has created for you

1. Thoughts and emotions
2. Hearing difficulties
3. Sleep
4. Concentration



Background on Tinnitus Activities Treatment

- Key principles:
  - Nurture patient expectations
  - Provide tinnitus counseling using pictures (Tyler & Bergan, 2001)
  - Implement a patient-centered approach
  - We begin tinnitus counseling by
  - Identifying problems
    - Tyler and Baker; Tinnitus Open Ended Questionnaire
    - Tinnitus Primary Functions Questionnaire (TPFQ; Tyler et al., 2014)
  - Providing an introductory session to Tinnitus Activities Treatment

Tinnitus Primary Functions Questionnaire

- 12 item version
- Determine the impact of tinnitus on everyday activities
  - 1) Emotions, 2) Hearing, 3) Sleep, 4) Concentration
  - High correlations with similar scales: Sleep, Depression, Trait anxiety, and THQ

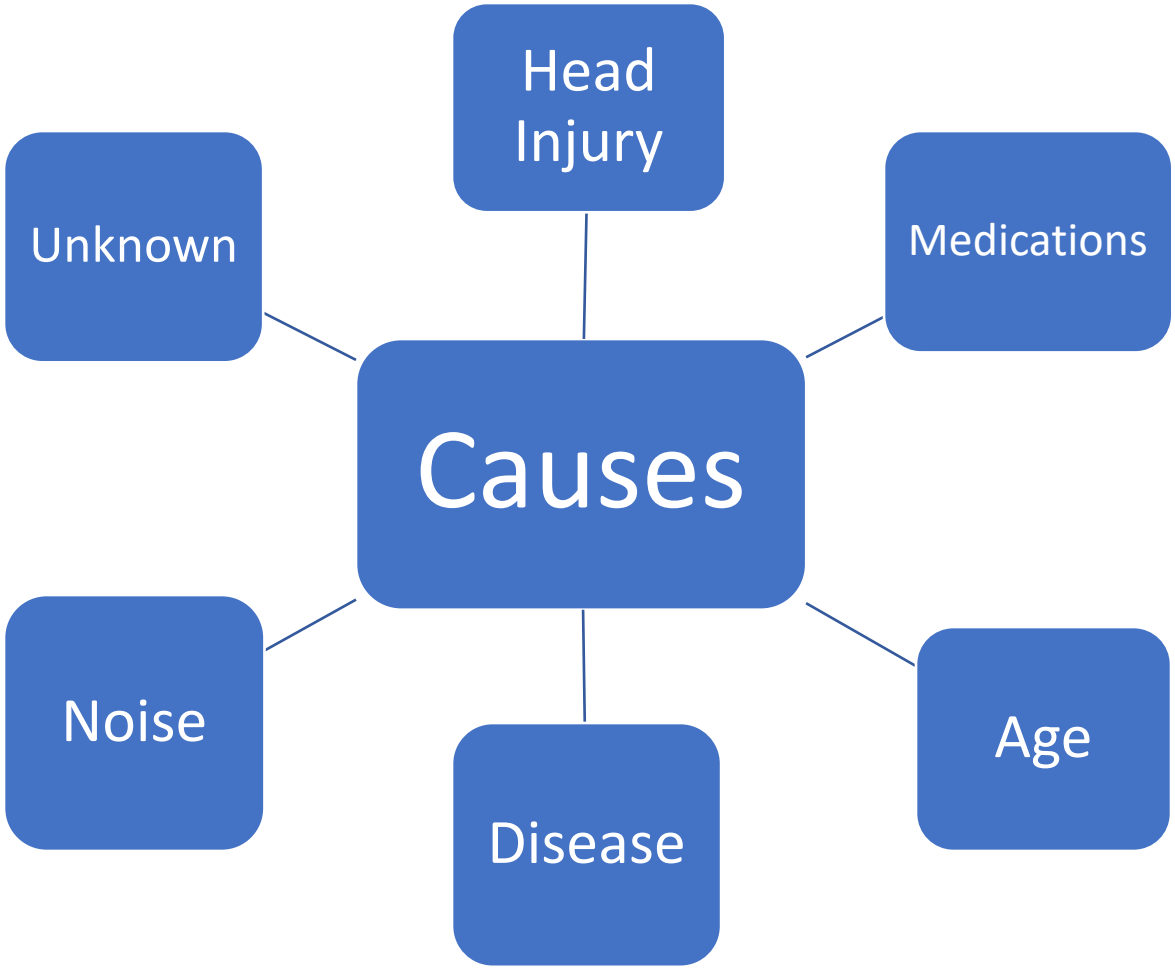
	0-Completely Disagree to 100-Completely Agree	*Subscale*
5.	I have difficulty getting to sleep at night because of my tinnitus.	*Sleep*
7.	I feel like my tinnitus makes it difficult for me to concentrate on some tasks.	*Concentration*
8.	I am depressed because of my tinnitus.	*Emotion*
9.	My tinnitus, not my hearing loss, interferes with my appreciation of music and songs.	*Hearing*

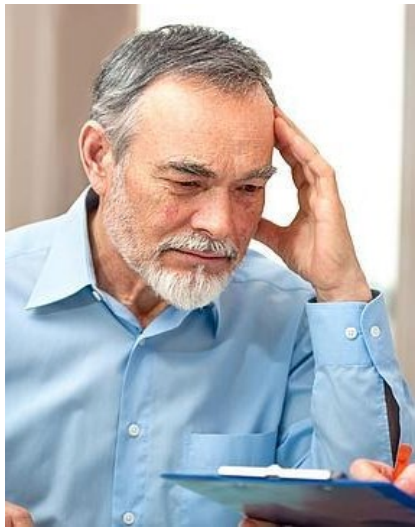
Tinnitus Activities Treatment

Introduction

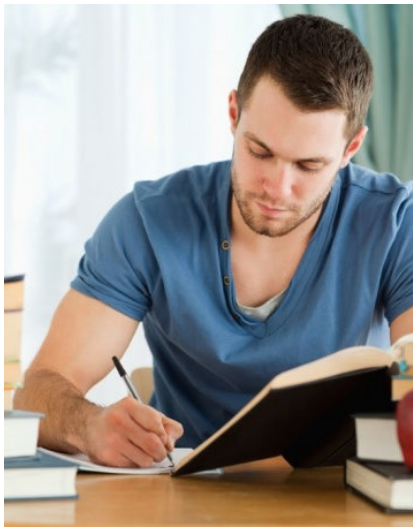
Where do YOU want to start?

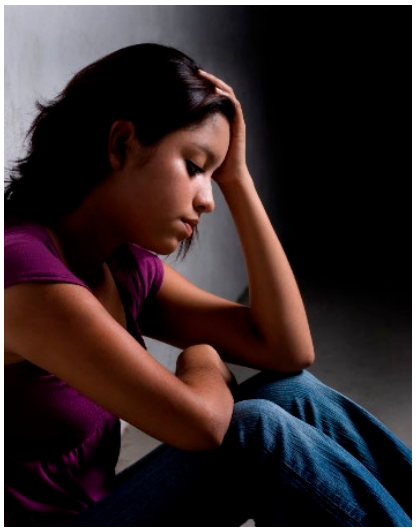
What do you think caused your tinnitus?





When your tinnitus began, what was your life like (home, work, etc.)?





How has tinnitus influenced your life?

How do YOU think we might be able to help?

Emphasize that it is THEIR session…

- Include the sessions relevant for patient
- Review and discuss materials
- Answer all questions
- Practice activities
- Provide homework

Conclude initial session by: answering remaining questions, discussing goals, and supporting patient

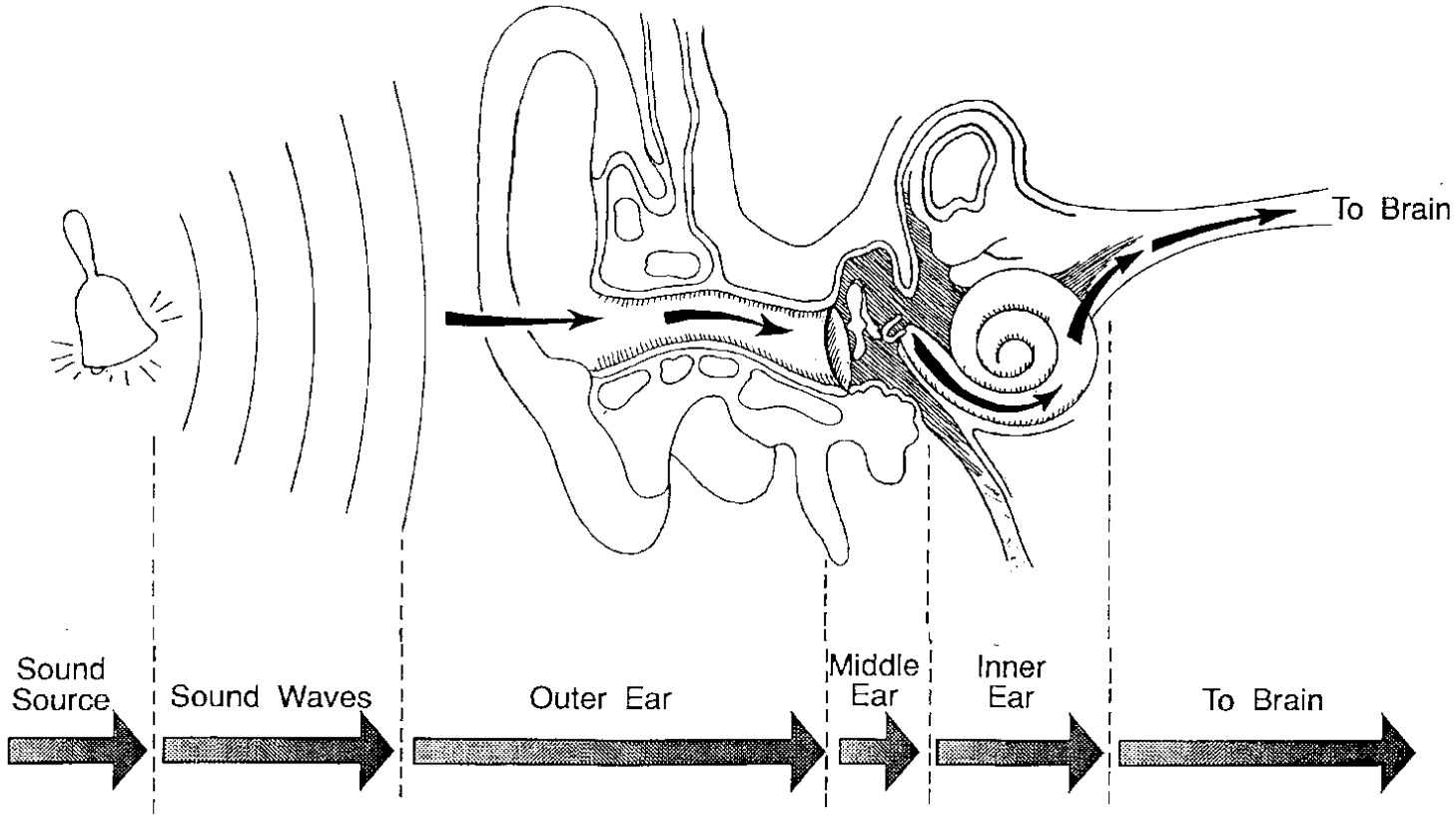
Overview of Sessions

- Thoughts and Emotions
- Hearing and Communication
- Sleep
- Concentration

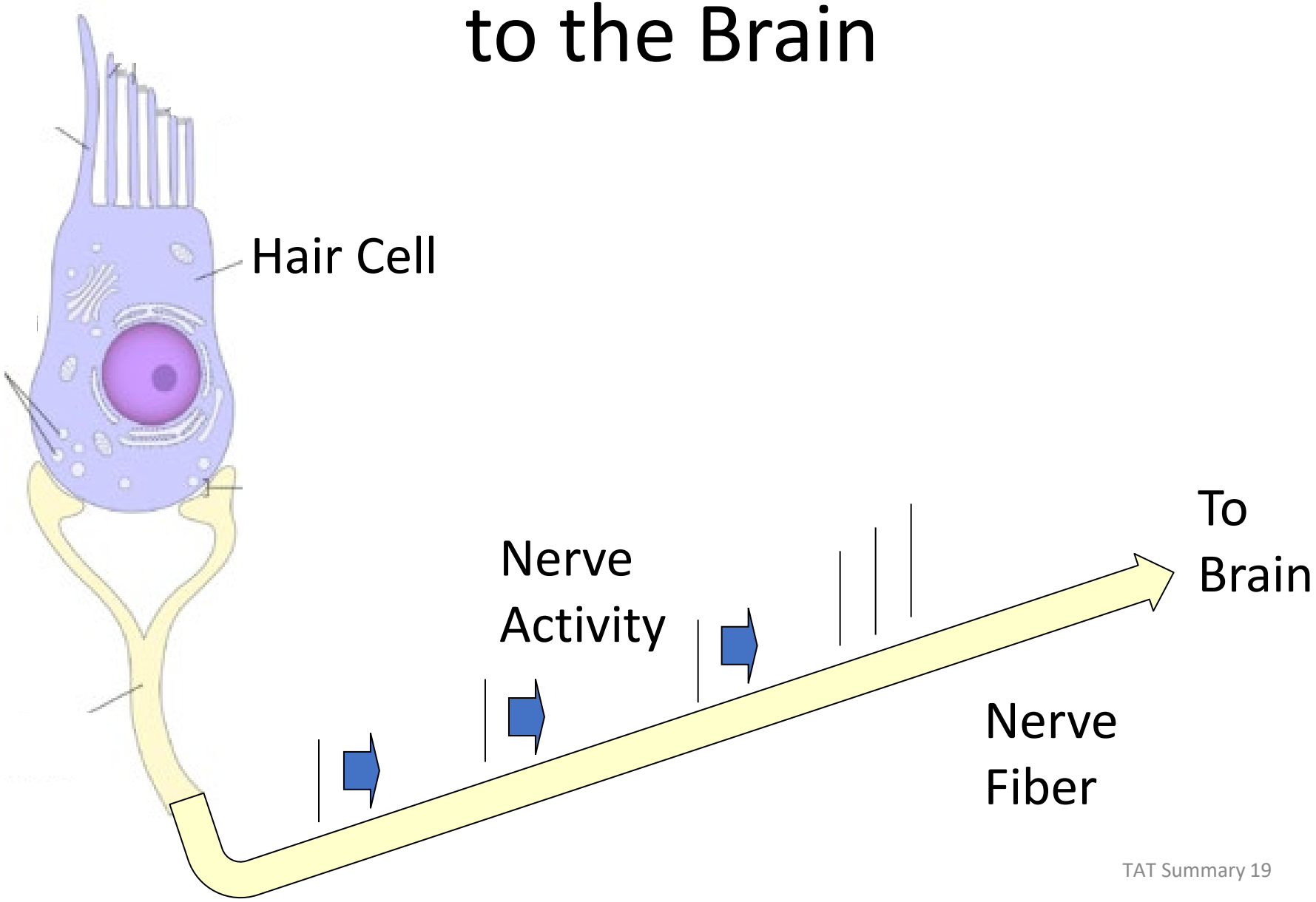
Part 1. Thoughts and Emotions

1. Hearing,
   hearing loss, and tinnitus
2. Attention, behavior, and
   emotions
3. Changing your reactions
   to tinnitus

1. How We Hear


To Brain
Sound Source
Sound Waves
Outer Ear
Middle Ear
Inner Ear
To Brain

Nerve Activity Carries Information to the Brain



Tinnitus is an Increase in Spontaneous Nerve Activity

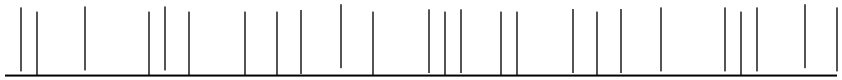
Normal Hearing

Hear Silence

Hearing Loss (No Tinnitus)

Hear Silence

Tinnitus



Hear Sound

2. Our Thoughts and Emotions

Doorbell → Neutral

Doorbell → Fire

Doorbell → Injury

Doorbell → Angry neighbor

Fire / Injury / Angry neighbor → Anxiety

Doorbell → Flowers

Doorbell → Friend

Doorbell → Delivery

Flowers / Friend / Delivery → Happiness

Things That Capture Our Conscious Attention

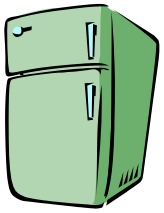
Unusual

Important

Scary

Unexpected

We Notice Important Things And Ignore Unimportant Stimuli



Refrigerator: Ignore

Lion: Cannot ignore

Crowd: Monitor information automatically

Tinnitus and Attention

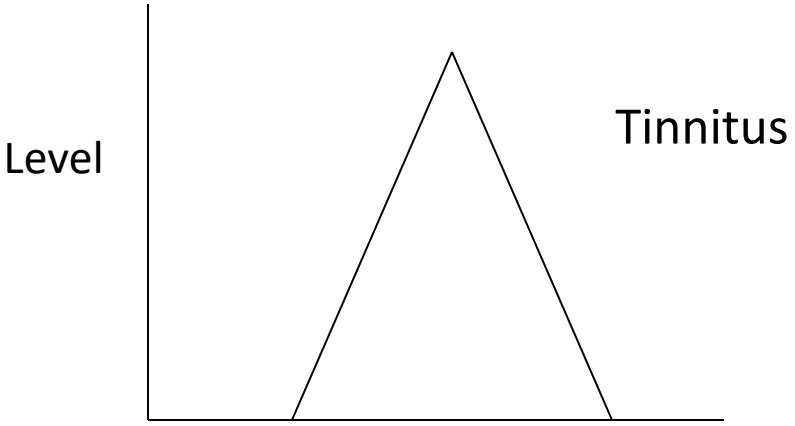
If brain determines **tinnitus is not important,** the tinnitus can be ignored

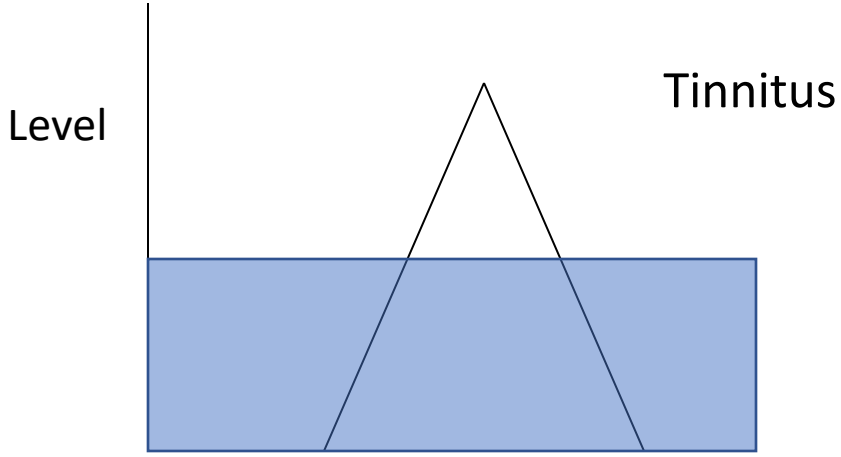
If brain determines **tinnitus is important,** we will pay attention to it

3. How to Change Our Reaction to Tinnitus

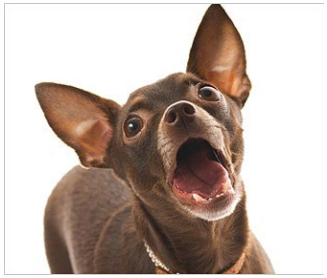
- Change Interpretation of Importance
- Change Emotional Reaction
- Refocus on Other Activities
- Reduce Contrast Between Background Sound and Tinnitus

Decrease Prominence of Tinnitus





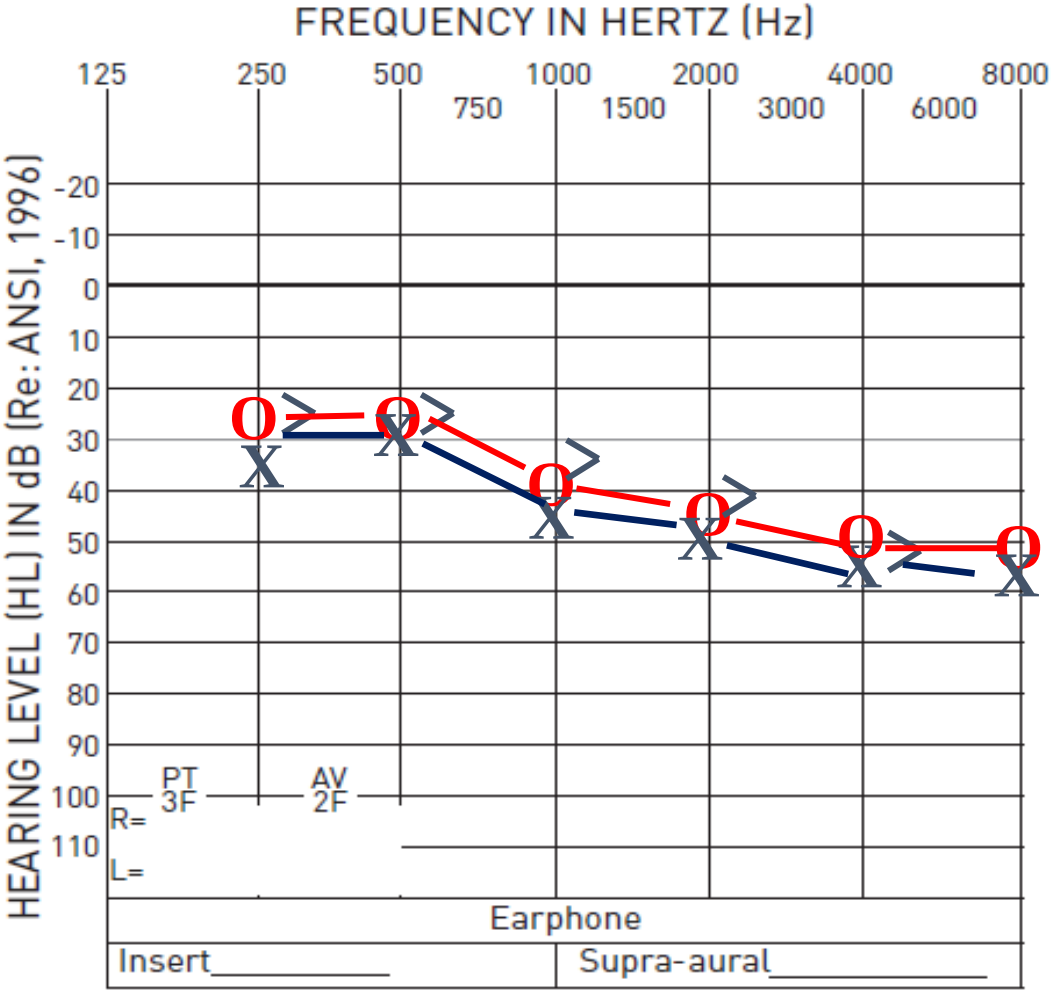
Background sound masks unwanted sounds



Part 2. Hearing and Communication

1. Hearing and communication difficulties
2. How tinnitus can affect hearing
3. How to improve your hearing

1. Your Audiogram

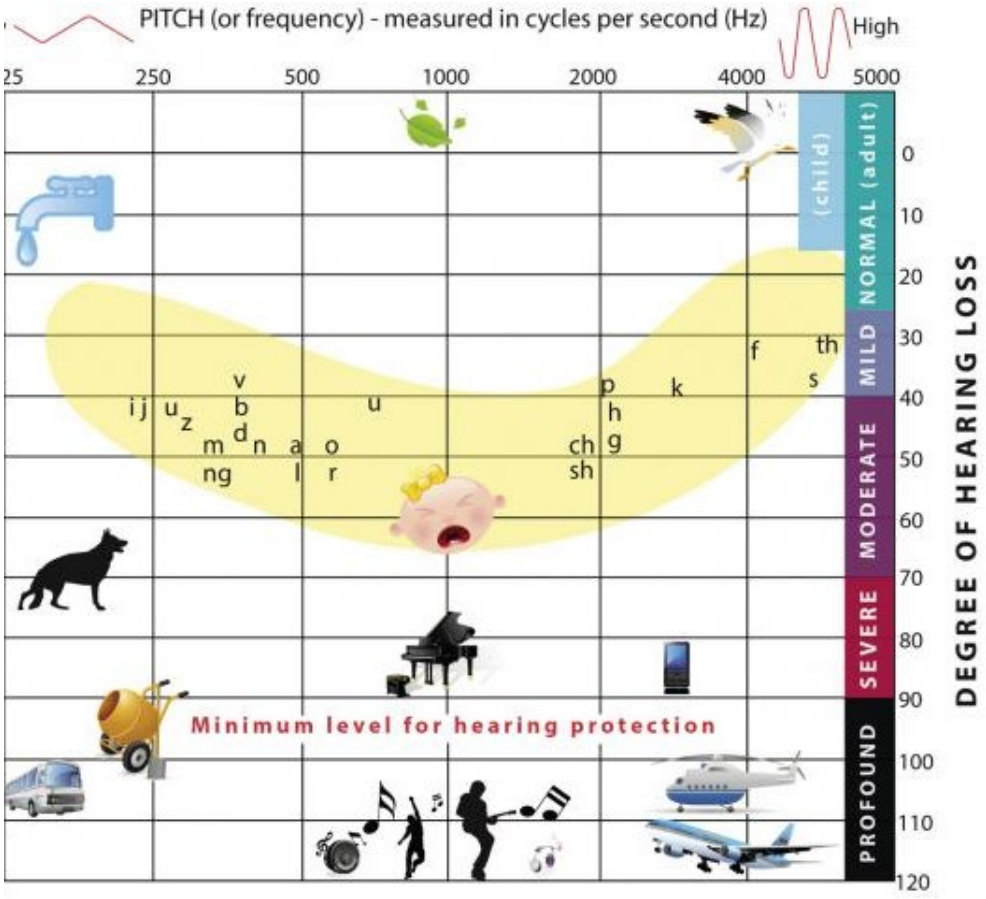


Factors that Affect Communication

- Hearing loss
- Background noise
- Ability to see the talker
- Familiarity with talker
- Familiarity with topic of discussion
- Stress level

How Hearing Loss Affects Communication

- Some sounds are not heard (high pitches)
- Some sounds may be distorted
- Low-pitched sounds are usually louder, so a high-pitched loss often is not noticeable
- May experience fatigue from struggling to communicate



2. How Tinnitus Can Affect Hearing

- Tinnitus is not damaging your hearing
- Tinnitus can make it harder to hear sounds and distract one from listening
- Tinnitus can also mask some sounds

3. Use Amplification

- Improve hearing and communication
- Reduce stress of effortful listening
- Hearing aids often help tinnitus:
  - Facilitates positive reactions to tinnitus
  - Helps to mask tinnitus sound

Part III. Sleep

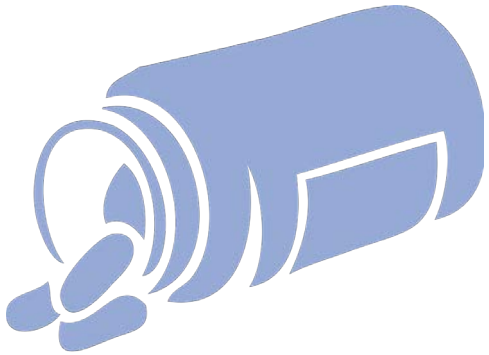
1. Normal sleep patterns
2. Tinnitus and sleep
3. Activities to facilitate sleep
4. Waking up at night

1. Normal Sleep Patterns

- The amount of sleep varies greatly from one individual to another
  - 6.5-9 hours/night
- Normal sleep includes several periods of light sleep or awakenings
  - Older adults have more awakenings
- Tinnitus doesn't usually wake people

2. Things That Affect Sleep

- Stress and emotions
- Environmental factors
  - Noise
  - Light
  - Temperature
- Irregular work schedules
- Learned sleeplessness patterns
- Jet lag/time zone changes



Things That Affect Sleep, continued

- Physical conditions (sleep apnea, restless leg
- Medications
- Caffeine (coffee, tea, cola, chocolate)
- Nicotine (smoking)
- Alcohol (excessive)
- Tinnitus

3. Activities to Facilitate Sleep

- Avoid napping
- Get regular exercise
- Create a curfew separating day and night
- Avoid food, drink, stress or exercise right before bed
- Go to bed only when you are tired enough to sleep

Preparing for Sleep

1. Listen to low-level background sound

2. Use Relaxation techniques to ease stress and tension

4. Waking Up At Night

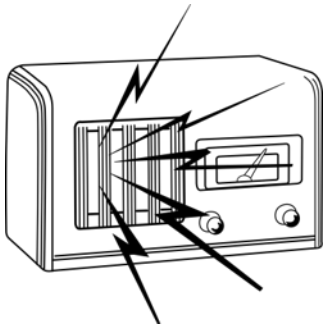
- Do not lie in bed if you are unable to fall or stay asleep
- Find something to do and return to bed when you feel tired
- Use background sound

Part 4. Concentration

1. Things that affect concentration
2. How tinnitus affects concentration
3. Strategies to improve concentration

1. Things That Affect Concentration

- The environment (noise, temperature)
- Your physical state (hunger, fatigue)
- Your emotional state (anxiety, fear)



2. How Tinnitus Affects Concentration

- When we focus attention to our tinnitus, it is harder to concentrate on other things
- Observe effects of tinnitus on concentration for simple and complex tasks
- Complex tasks are more demanding—tinnitus is less noticeable

3. Strategies to Improve Concentration

1. Interpret tinnitus as not important
2. Eliminate distractions
3. Stay focused
4. Adjust work habits
5. Decrease prominence of tinnitus
6. Take control of your attention

Take Control of Your Attention

- The focus of our attention is largely under voluntary control
- You can learn to control the focus of your attention under various conditions
- By bringing the focus of attention under control, tinnitus-related distress will be reduced at certain times

Attention Diversion Activities

- We are all different
- Keeping active in some way can divert our attention away from the tinnitus…..
- Guided Imagery, meditation, mindfulness, garden therapy, art therapy…..
- We are all different.

HEARING AIDS FOR TINNITUS

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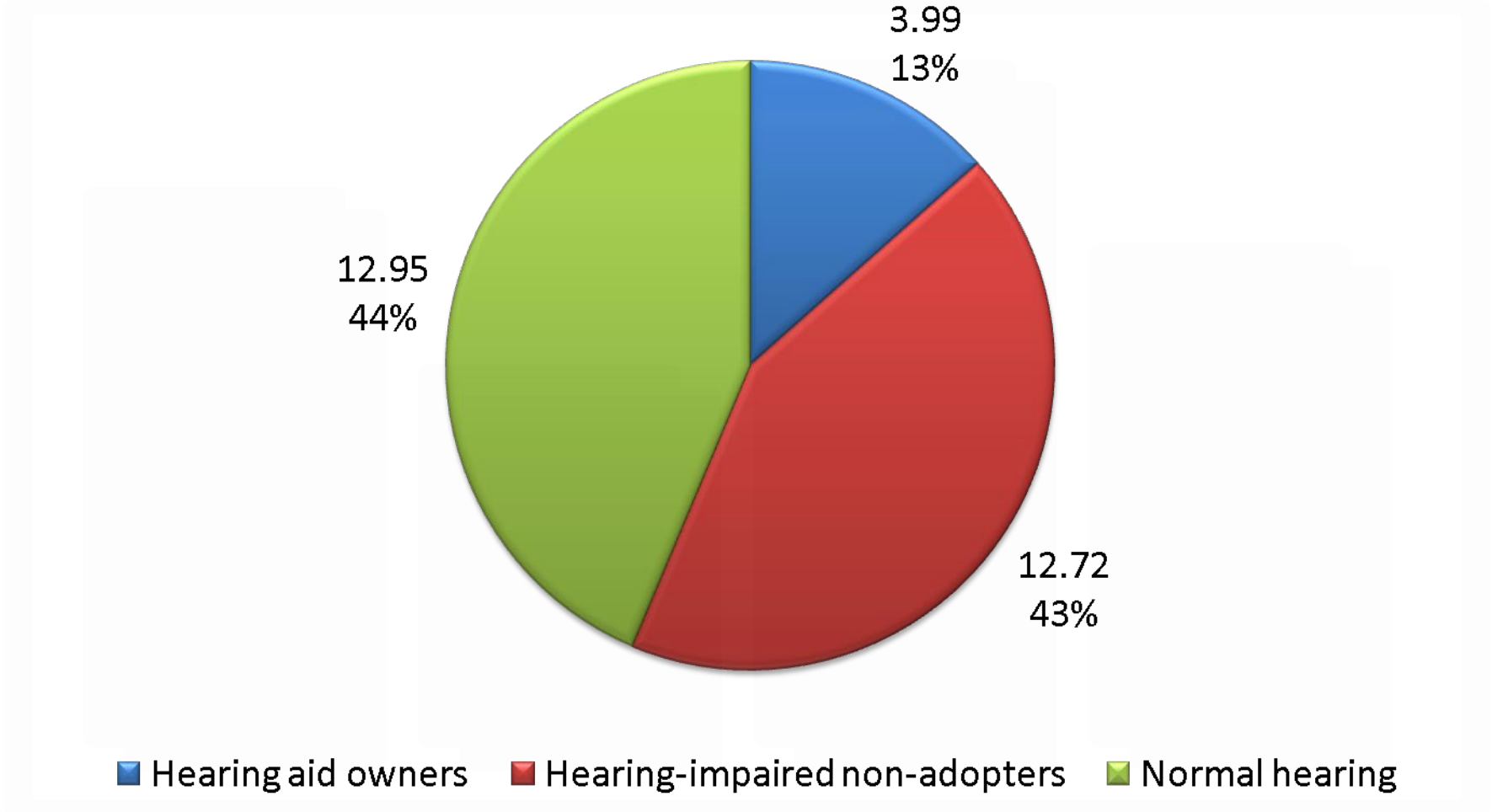
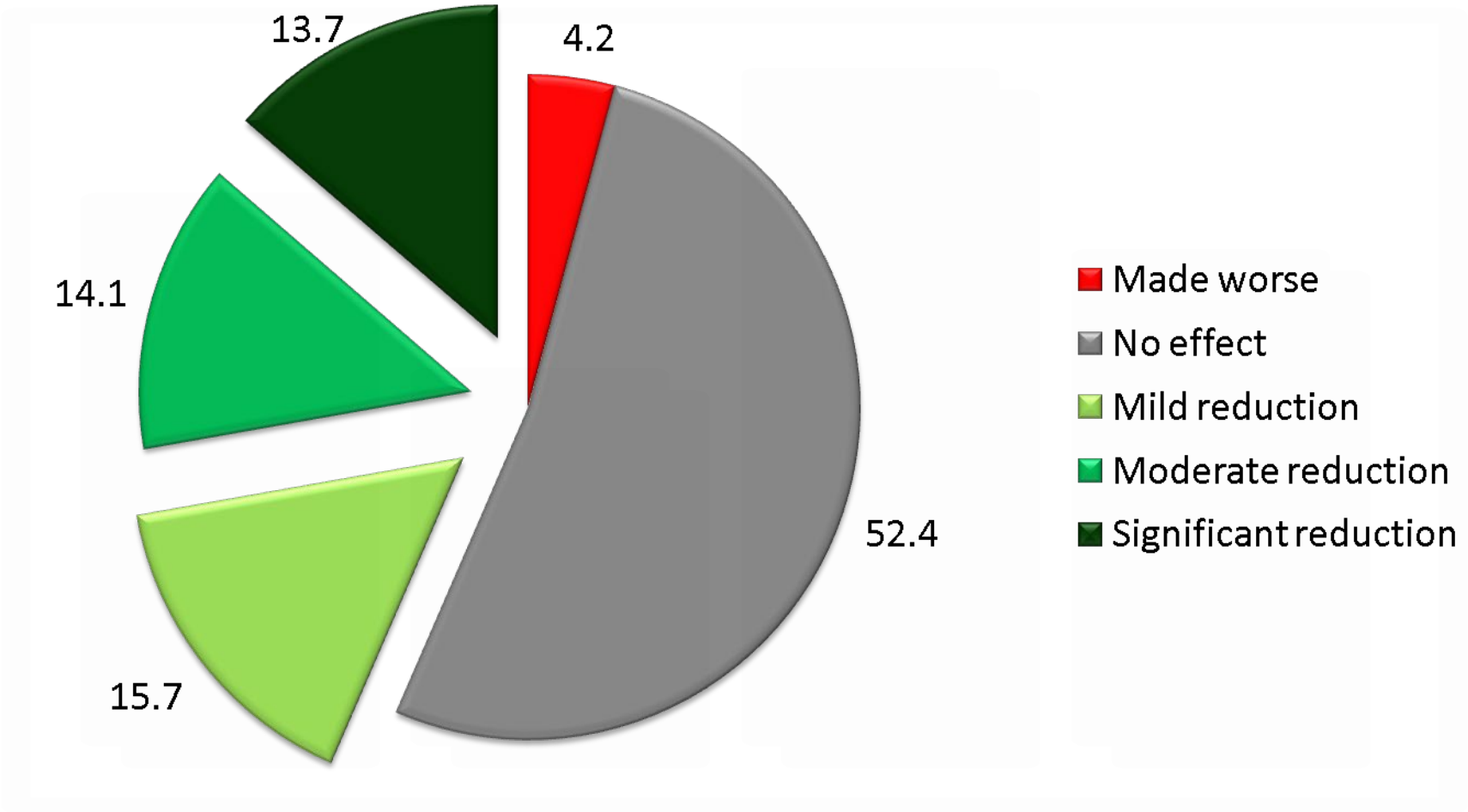
Figure 1. Tinnitus population (millions, 2008)



Kochkin, Tyler & Born (2011)

Direct Query on Hearing Aids.
Effectiveness in mitigating effects of tinnitus (n=1,314)



Kochkin, Tyler & Born (2011)

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Hearing Aids

could help tinnitus because:

- Improve Communication
  - Therefore Reduce Stress
- Amplify Background Sound
  - distraction/partial masking

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Typical assumption for hearing aids

- Background noise is undesirable
- Therefore
  - Noise reduction circuits
  - Focused directionality microphones
  - Do not amplify low level sounds as much as high level sounds (input output function)

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But : HA Fitting with tinnitus patients

- Tinnitus
  - Low-level noise likely desirable
    - Amplify low level everyday sounds
    - Do not attenuate low-level sounds

- In contrast to hearing loss without tinnitus
  - Low-level noise undesirable

General approach for fitting hearings for tinnitus

- Best fitting possible for communication
  - Reduce stress, enjoy life
- Low-level noise desirable
    - Amplify low level everyday background sounds
    - Do not attenuate low-level everyday background sounds
- Cannot Determine Effectiveness In Sound Proof Room

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Fit hearing aids to enable environmental sound to partially mask

- Open ear molds to allow background sound
- No directional microphones
- Higher gain at low levels
- No noise reduction
- Consider Extending Low Or High Frequency Range Of Amplification

- Different programs for
  1. tinnitus reduction
  2. maximizing speech understanding

Hearing aids can make tinnitus worse !!

- Does not happen very often
  - 1 in 100 ???
- Amplified sound exacerbates tinnitus
- Turn gain down, reduce maximum output
  - Over several months, increase gain
- Tactile sensation around ear could make tinnitus worse
  - Try alternative aid/earmold strategies

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Tinnitus Sound Therapy

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Treatment developed

- Vernon (1984)
  - wearable devices
  - Total masking; but patient must decide on actual level so not disturbing

Neurophysiological Models

- Tinnitus result of changes in spontaneous activity
- Can reduce prominence of abnormal spontaneous activity by adding noise

Low level noise makes tinnitus more difficult to detect

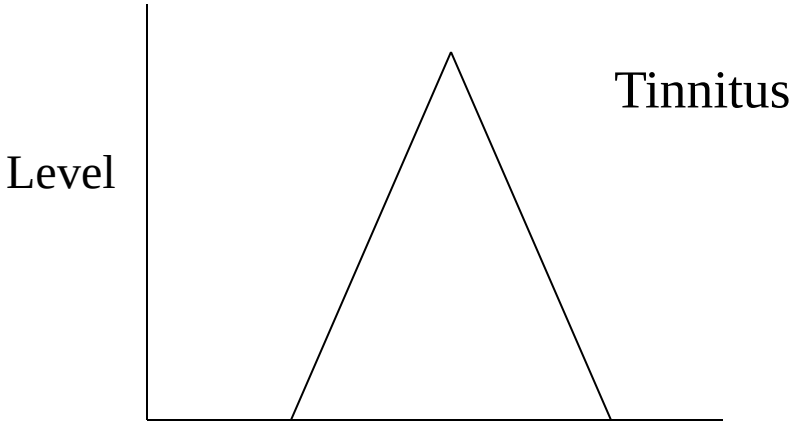
(from Tinnitus Activities Treatment)

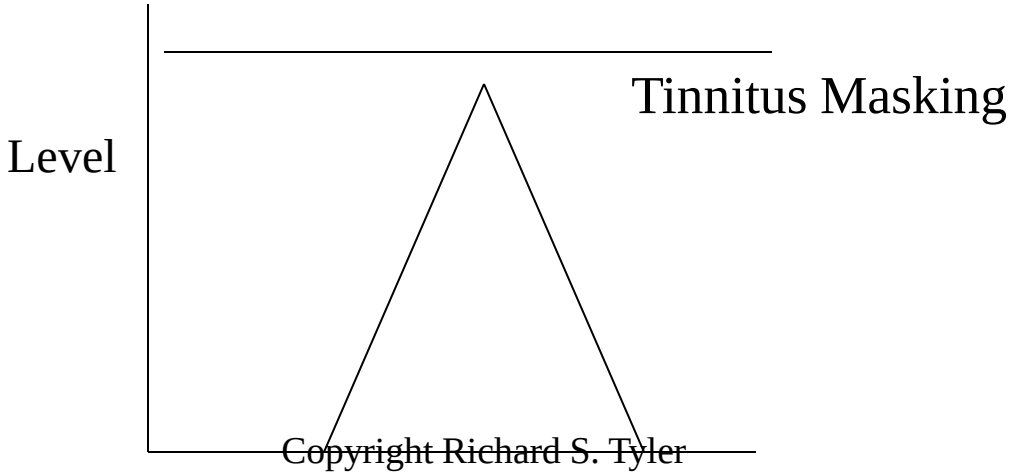
Tinnitus

Low Level Noise

Tinnitus in Low Level Noise

Complete/Total Masking





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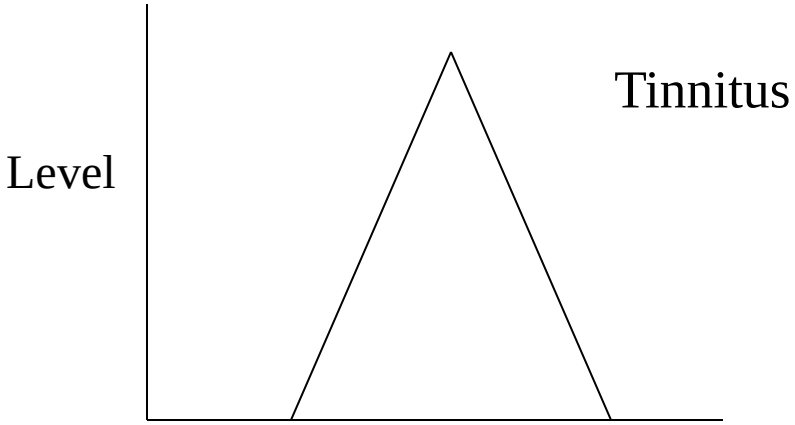
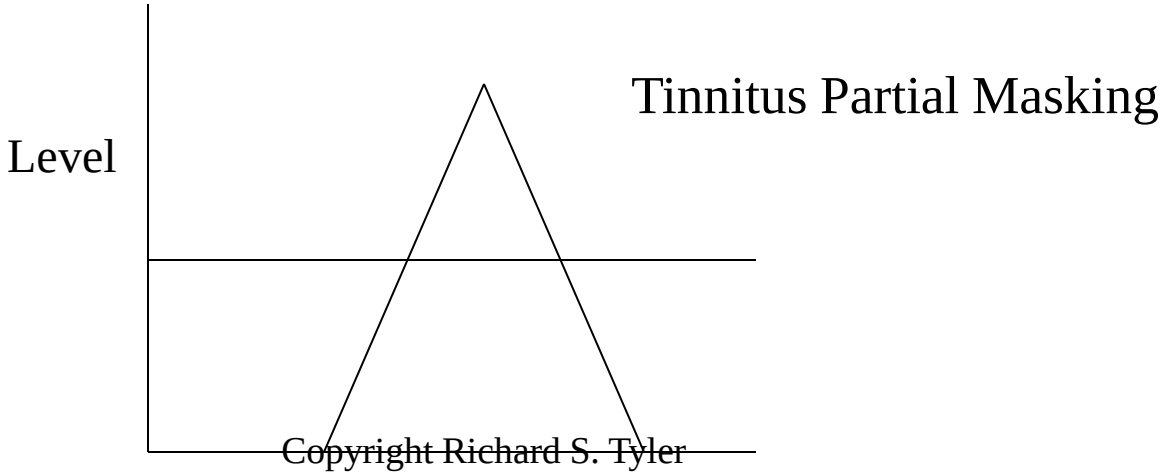
Partial Masking





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Partial Masking

- good if bothered by higher-level noise or if complete masking requires high levels
- Caution, perception of noise often adapts, don’t want the patient ‘chasing after the noise’ and raising the level

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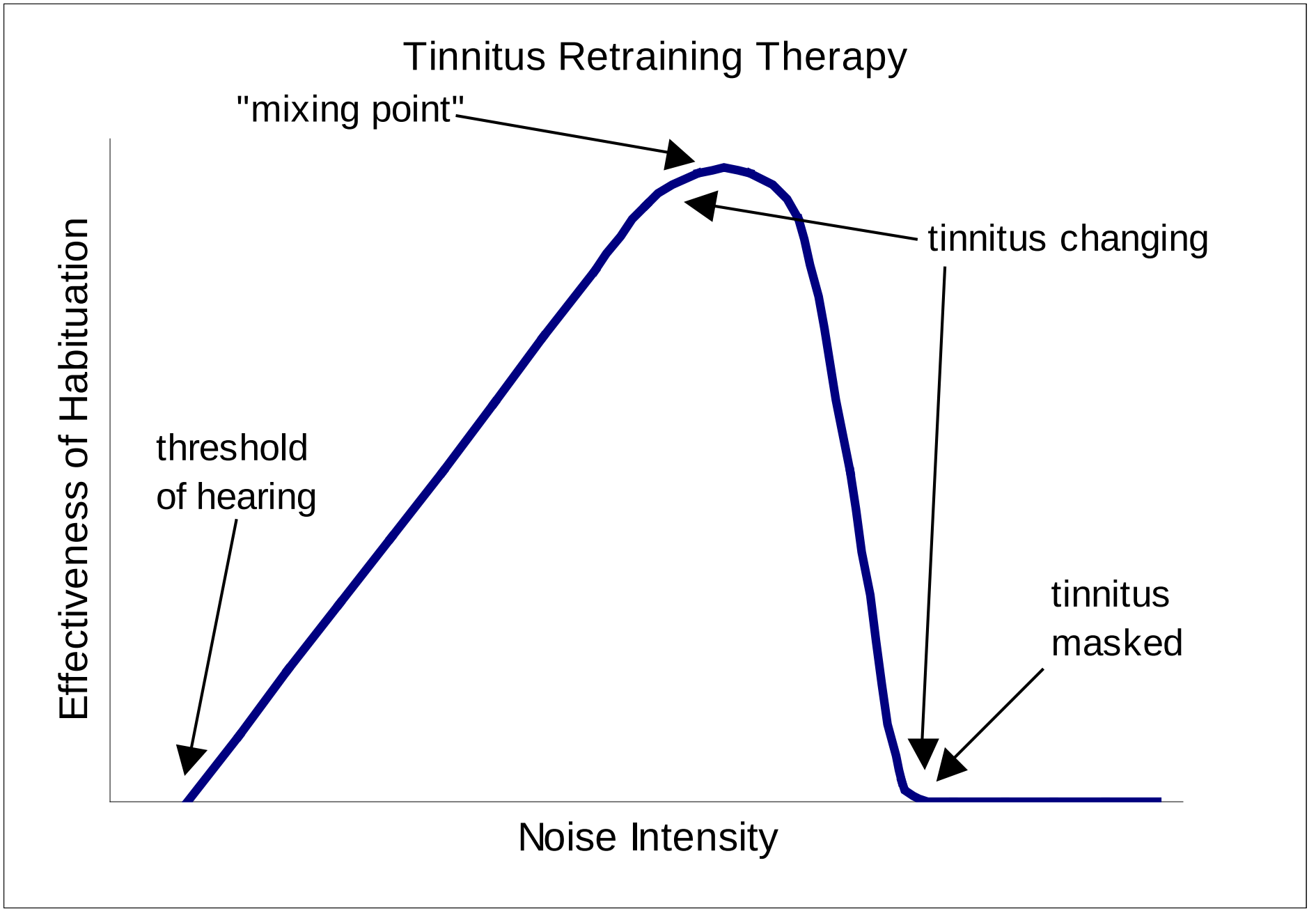
“Mixing Point”

- Jastreboff (1995) “where the patient perceives that the tinnitus sound and the external sound start to mix or blend together” (Tinnitus Retraining Therapy).


Tinnitus Retraining Therapy
"mixing point"
tinnitus changing
threshold
of hearing
tinnitus
masked
Effectiveness of Habituation
Noise Intensity

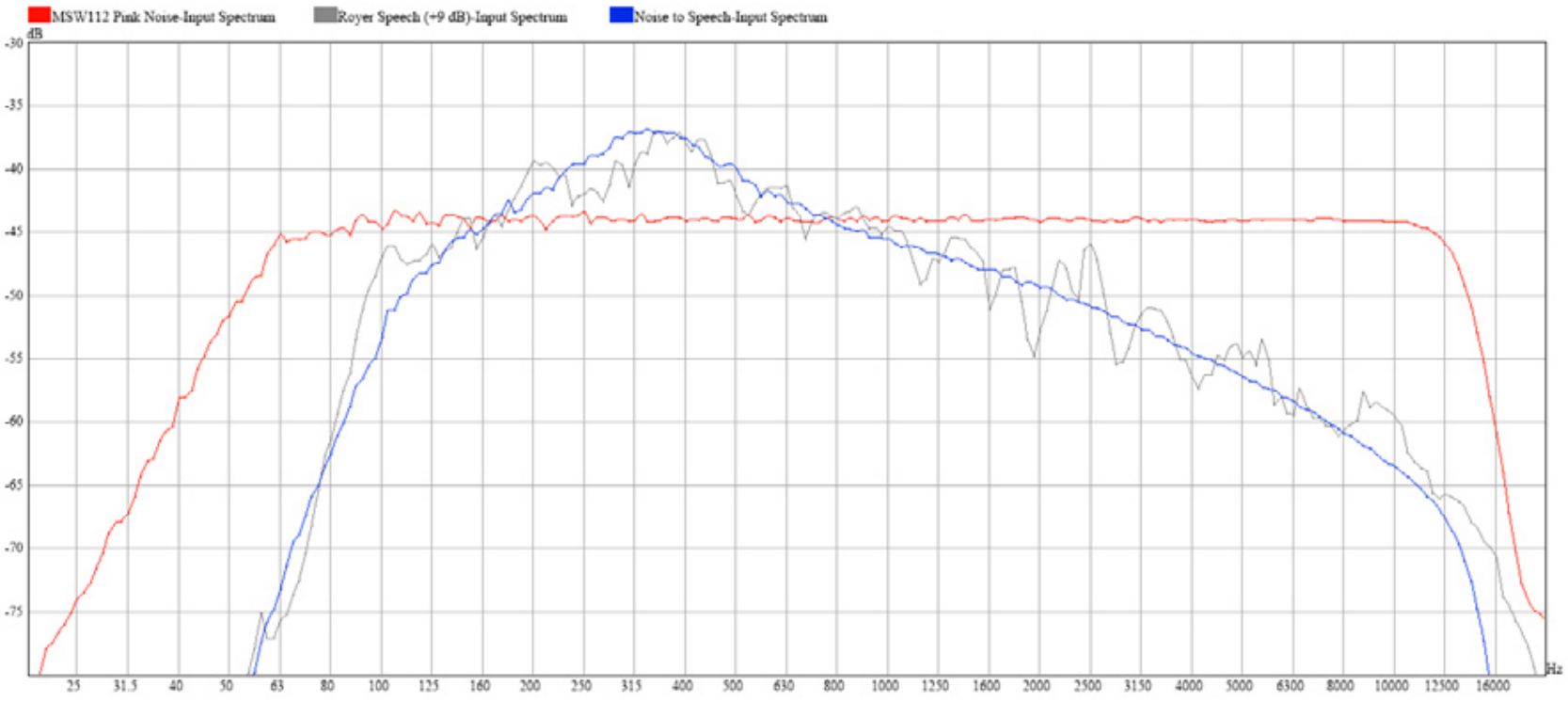
Tinnitus Activities Treatment

- Mixing point too loud for most patients
- Mixing point should **not** be the goal in Partial Masking
- Use lowest level that is effective
- Some prefer total masking
- Mixing point is not superior to total masking
- Tyler, R., Noble, W., Coelho, C., & Ji., H. (2012). Tinnitus Retraining Therapy: Mixing Point and Total Masking Are Equally Effective. **Ear Hear** 33(5):588–594

Sound Therapy Stimulus Options

- Broadband noise
- Noise modifying spectrum
- Noise modifying envelope
- Combined tones, modulated tones
- Music, processed music
- Spectrally adjusted sounds to account for the audiogram
- Notch noise or music around pitch match

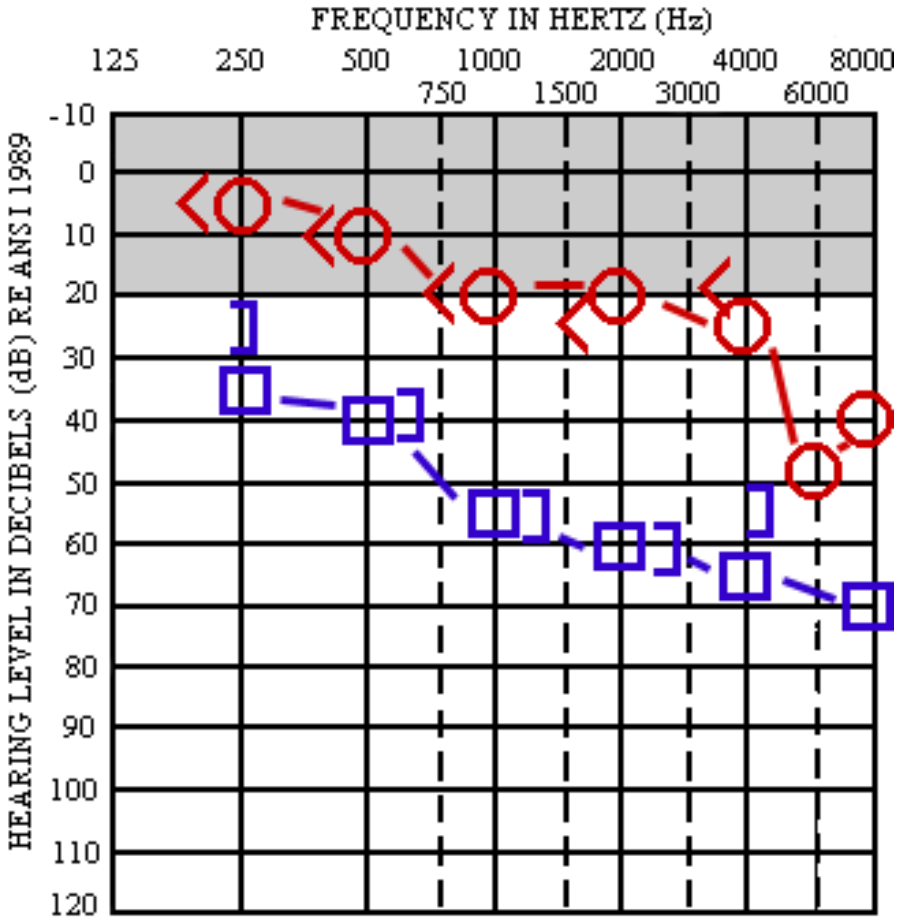
Broadband Noise and Speech Shaped Noise



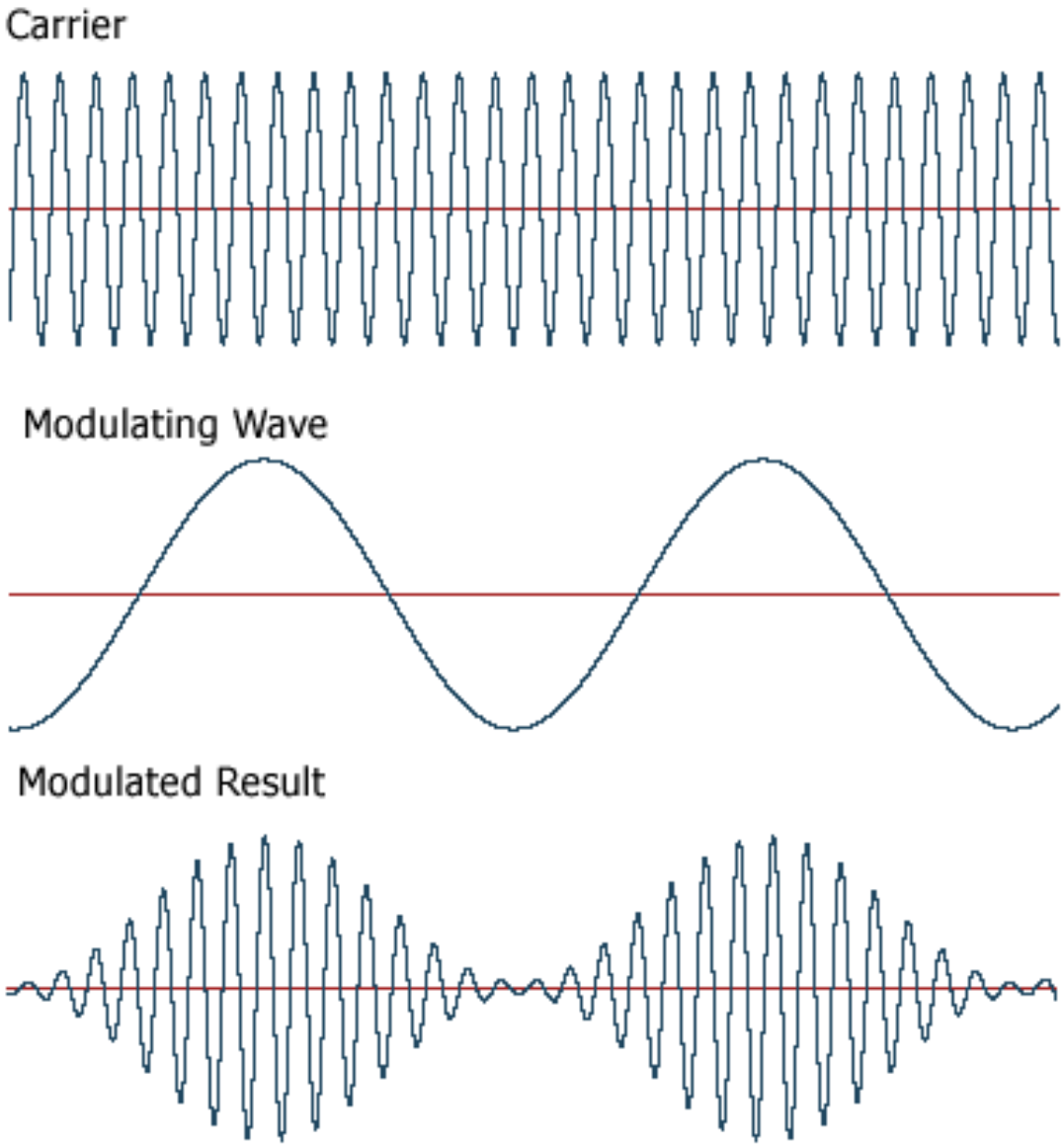
Level (dB)

Frequency (Hz)

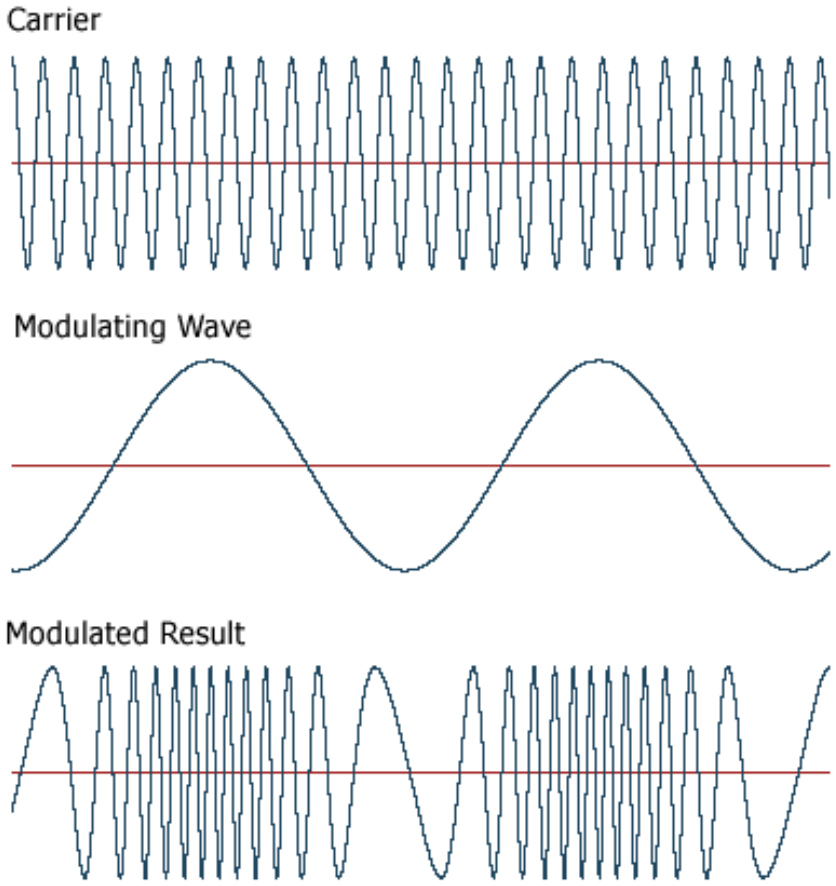
Noise to inversely match the audiogram



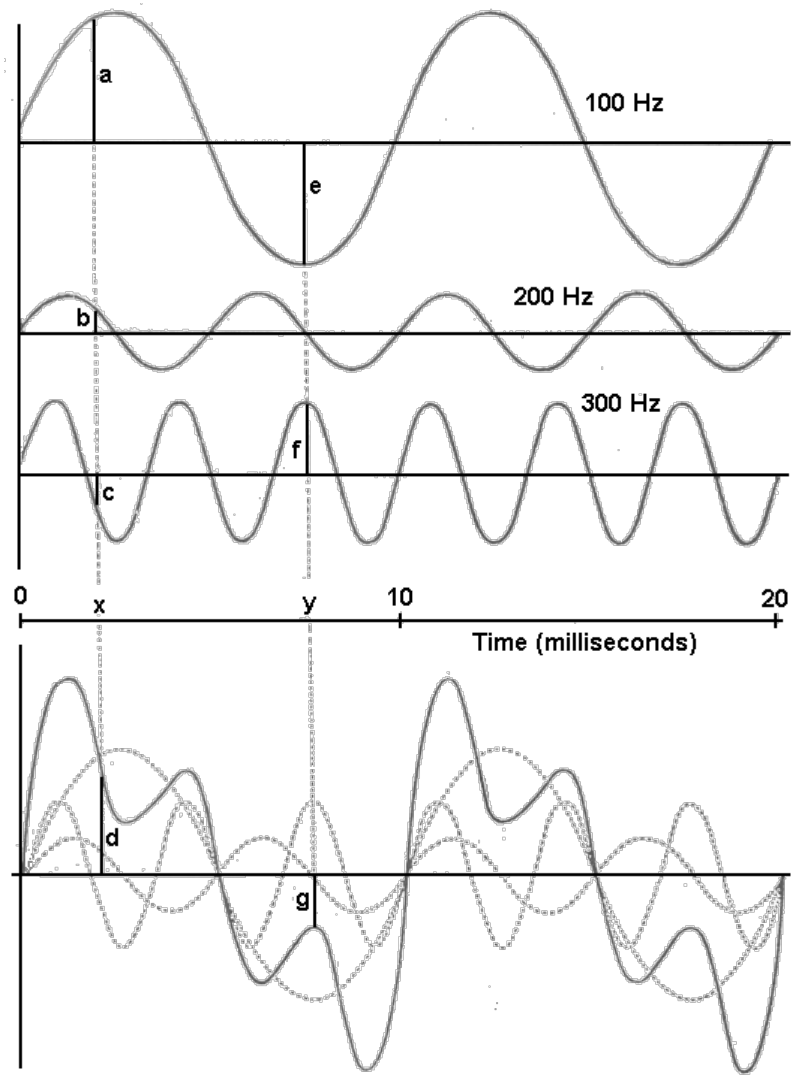
Amplitude Modulation (tones or noise)

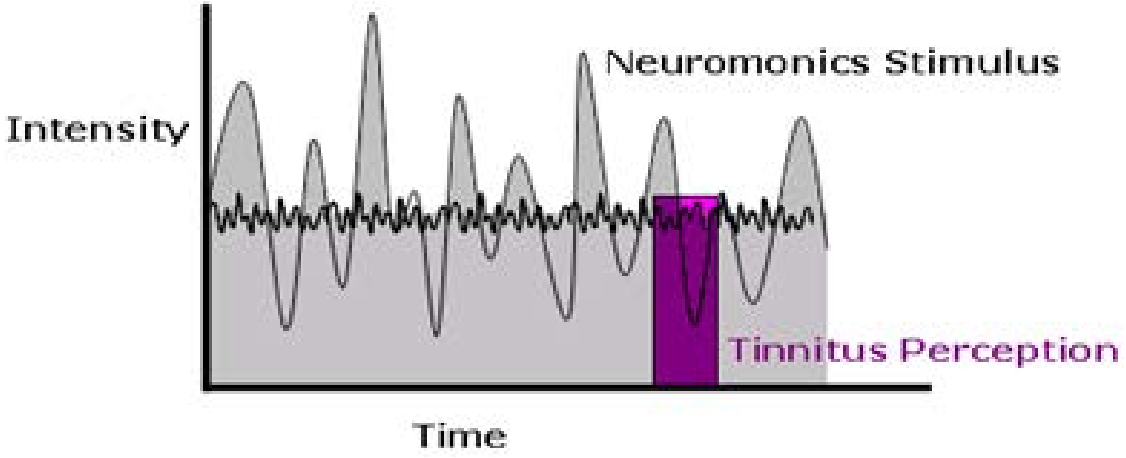


Frequency Modulation

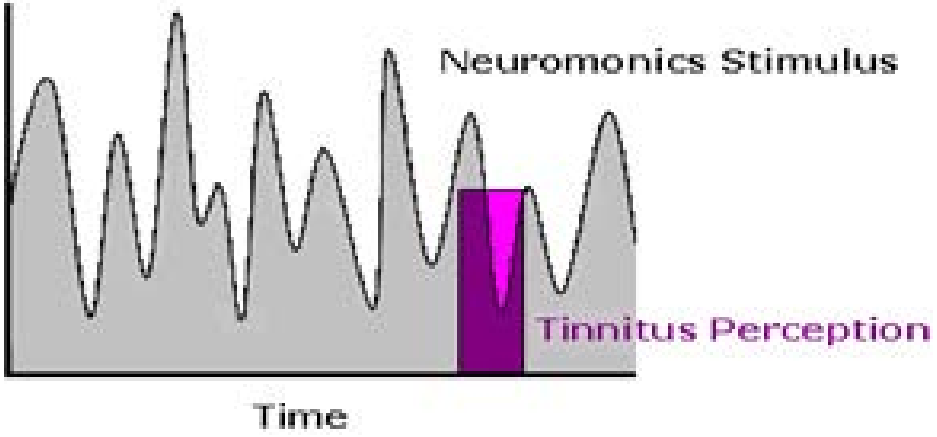


Adding tones – spa tones, Zen tones



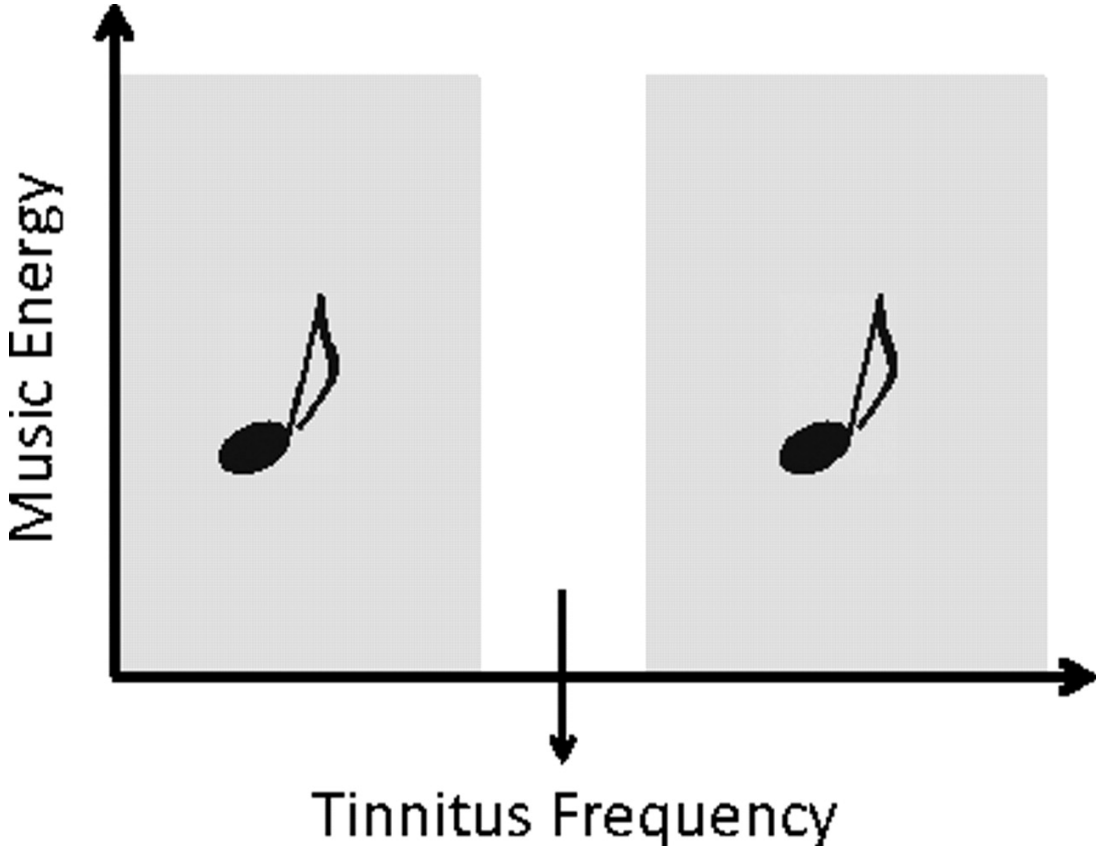


Stage 1 – Processed Music inversely matched to audiogram + noise



Stage 2 – Processed Music inversely matched to audiogram

Okamoto H et al. PNAS 2010;107:1207-1210



frequency band 1-octave
cantered at tinnitus pitch-match frequency removed

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Fitting considerations

- Broadband noise easier to listen to than narrowband noise
- Sound usually does not have to overlap the tinnitus pitch
- Can present in contralateral ear in some patients
- Try monaural and binaural fittings
- Use low-level stimuli to reduce speech interference, less likely to enhance tinnitus

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Do NOT use
Tinnitus Sound Therapy

- If noise makes tinnitus worse
- (acclimatize to noise first at low level for brief interval)
- If have hyperacusis (treat first)
  - Hyperacusis Activities Treatment

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Non-wearable maskers

- Locations
  - Office/workspace/home
  - Bedroom for sleep – leave on all night
- Device options
  - Specialty instrument
    - Plays ocean waves, rain on leaves, etc
  - Music player

    Radio, cell phone, compact disc player
  - Household appliances
    - Fan, detuned radio

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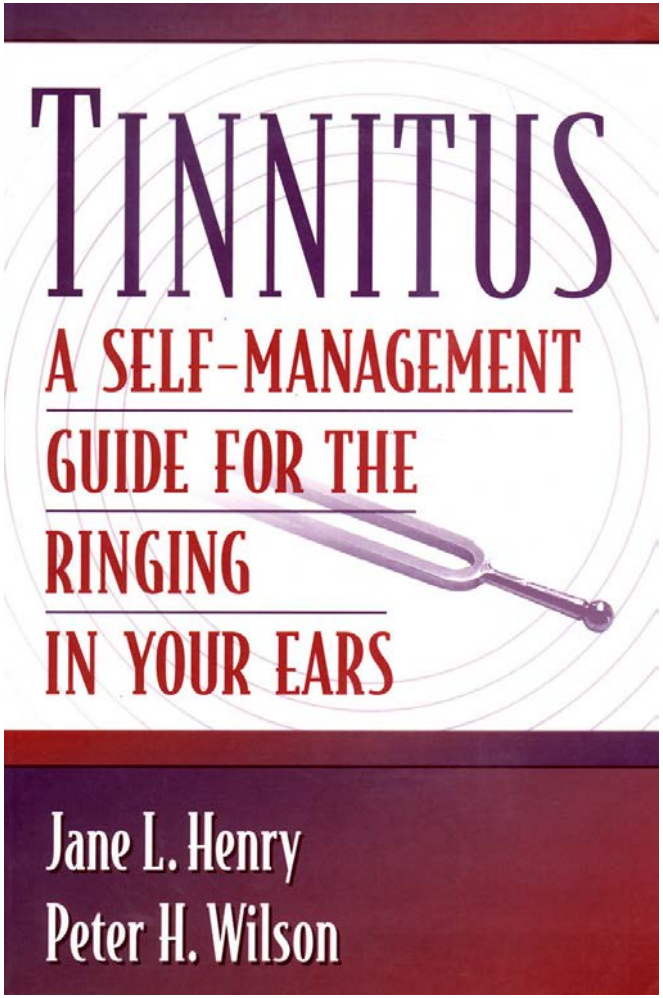
Conclusions
Tinnitus Activities Treatment

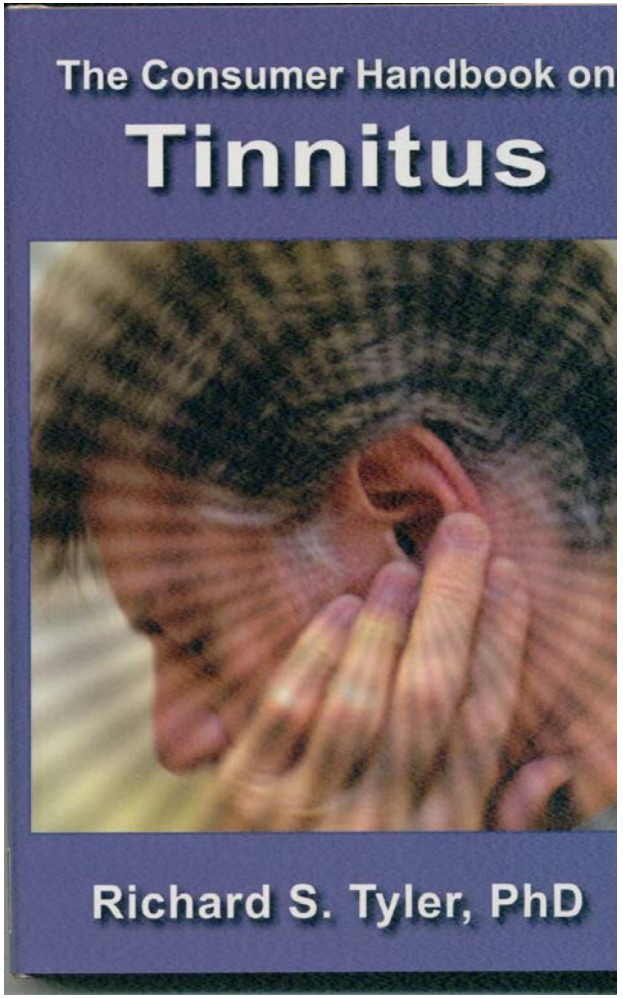
- Tinnitus Primary Functions Questionnaire
- Thoughts and Emotions, Hearing, Sleep, Concentration
- Hearing Aids , control maximum output
- Sound Therapy – variety of effective sounds, low levels partial masking preferable (not Mixing Point)
- Hyperacousis Activities Treatment
  - Record troublesome sounds

Tinnitus Activities Treatment

- Images available free!
- https://medicine.uiowa.edu/oto/research/tinnitus-and-hyperacusis

- For full descriptions, refer to:
  - Tyler et al. (2006), Tinnitus Treatment: Clinical Protocols.
  - Tyler et al. (2014), Katz Handbook of Clinical Audiology.





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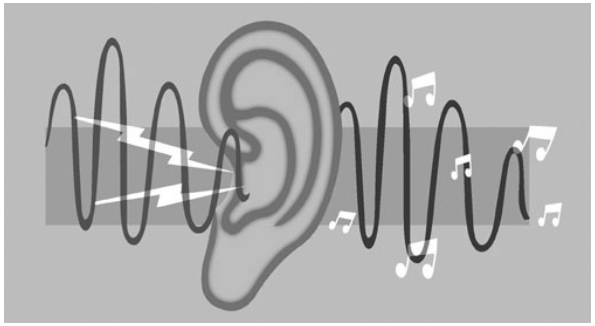

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