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- Call 800-753-2160 (M-F, 8 AM-8 PM ET)
- Email customerservice@AudiologyOnline.com
Tinnitus Activities Treatment

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The Department of Otolaryngology - Head and Neck Surgery
Department of Communication Sciences and Disorders
The University of Iowa

Learning Outcomes

1. Measure and evaluate the consequences of tinnitus.
2. Provide counseling for difficulties in Thoughts and Emotions, Hearing, Sleep and Concentration.
3. Provide Sound Therapy and fit hearings to tinnitus patients.
Tinnitus Activities Treatment

Overview

- 4 Topics
  1. Thoughts & Emotions
  2. Hearing
  3. Sleep
  4. Concentration
    - Chosen based in individual needs

- One Topic per counseling session

- Homework activities assigned, practiced in clinic, & reviewed next visit
Tinnitus Activities
Treatment

Introduction

Where do
YOU want to
start?
What do you think caused your tinnitus?

Causes

- Head Injury
- Medications
- Noise
- Disease
- Age
- Unknown

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?
How would you describe yourself?
- E.g., curious?
- concerned?
- distressed?

What are some things you are doing to help your tinnitus?

---

Four Topic Areas Considered in our Treatment

1. Thoughts and Emotions
2. Hearing and Communication
3. Sleep
4. Concentration
1. Thoughts and Emotions

- Hearing, hearing loss, and tinnitus
- Attention, behavior, and emotions
- Changing your reactions to tinnitus

2. Hearing and Communication

- Hearing and communication difficulties
- How tinnitus can affect hearing
- How to improve your hearing
3. Sleep

- Normal sleep patterns
- Tinnitus and sleep
- Activities to facilitate sleep
- Waking up at night

4. Concentration

- Things that affect concentration
- How tinnitus affects concentration
- Strategies to improve concentration
Your sessions...

- Include the sessions relevant for you
- Review and discuss our materials
- Answer your questions
- Practice activities
- Provide homework

Tinnitus Activities Treatment
Thoughts and Emotions Session
Overall Plan

1. Hearing and hearing loss
2. Tinnitus
3. Attention, behavior, and emotions
4. Changing your reactions
5. Activities for home

Part 1: Hearing & Hearing Loss

1. How we hear, and what is hearing loss
2. Causes of hearing loss
How We Hear

Nerve Activity Carries Information to the Brain

- Sound Source
- Sound Waves
- Outer Ear
- Middle Ear
- Inner Ear
- Nerve Fiber
- Hair Cell
- Nerve Activity
- To Brain
- To Brain
Spontaneous Activity on Hearing Nerves

No Sound (Quiet)

Hear Silence

Different Nerve Responses Result in the Perception of Different Sounds

No Sound (Quiet)

Hear Silence

Word “Table”

Hear “Table”

Sound of a Cricket

Hear a Cricket
Causes of hearing loss

Causes

- Head Injury
- Medications
- Noise
- Age
- Disease
- Unknown

Nerve Activity

Normal Hearing: Lots of information sent to the brain

Hearing Loss: Limited information sent to the brain
Solutions for Hearing Loss

Cannot Replace Hair Cells

Hearing aids can help make sounds:
- Louder
- Easier to understand
- Do not restore normal hearing

Your Audiogram
Your Hearing?

- Do you have a significant hearing loss?
- What difficulties does your hearing loss create?
- What steps have you taken to improve your hearing?

Part 2: Tinnitus

- A sound in ear(s) or head
- Heard differently by different people
  - (e.g. ringing, buzzing, hissing, etc.)
Tinnitus and Hearing

- Tinnitus results from damage to the hearing system
  - May be associated with hearing loss
- Tinnitus will not damage your hearing
- Hearing may continue to decrease, but not because of tinnitus

There Are Many Different Causes of Tinnitus

- Head Injury
- Medications
- Noise
- Age
- Disease
- Your Cause?
- Unknown
Tinnitus is Common

- 15 in 100 (15%) people have tinnitus
- 1 in 100 (1%) people have troublesome tinnitus
- 30 in 100 (30%) people over 60 years old have tinnitus

Expectations for Relief

- Currently no drug or surgery can reliably eliminate the source of tinnitus

- However, **YOU** can change your reaction to tinnitus and how it affects you
Auditory System

- Tinnitus, whatever the cause, must be represented in the brain in the auditory area. It is represented there like any other sound. It can be measured.

Tinnitus is an Increase in Spontaneous Nerve Activity

<table>
<thead>
<tr>
<th>Normal Hearing</th>
<th>Hear Silence</th>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Hearing Loss (No Tinnitus)</th>
<th>Hear Silence</th>
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<tbody>
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</table>

<table>
<thead>
<tr>
<th>Tinnitus</th>
<th>Hear Sound</th>
</tr>
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<tr>
<td></td>
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</tr>
</tbody>
</table>
What does your tinnitus sound like?

- Whistle
- Cricket
- Another sound?

PART 3: ATTENTION

1. Types of attention
2. How things capture our attention
3. Emotional state has an effect on attention
Many Stimuli Compete for Our Attention

- Touch
- Smell
- Vision
- Sound
- Taste

We can direct our conscious attention to different smells, sounds, or things we feel.
An important sound can grab our attention

Things That Capture Our Conscious Attention

- Unusual
- Important
- Scary
- Unexpected
Deciding to Pay Attention

Everything is OK (no longer attend)

Do something, then will be OK (and will no longer attend)

Uncertain, may be important? (continue to attend)

Tinnitus does not...

- Make you deaf
- Lead to senility
- Imply a sign of mental illness

- When you worry about such things, you can become preoccupied with tinnitus
Activities

- Describe an image you like (e.g. a new car) and one you don’t like (e.g. a snake)
- Describe a sound you like (e.g. music) and one you don’t like (e.g. a siren)
- Describe your tinnitus

PART 4: CHANGE THE EMOTIONAL REACTION TO TINNITUS
Understand the Connection Between our Thoughts and Emotions

Thoughts

1. Neutral
2. Negative
3. Positive

Our Thoughts and Emotions

Doorbell → Neutral

Doorbell
- Fire → Anxiety
- Injury → Anxiety
- Angry neighbor → Anxiety

Doorbell
- Flowers → Happiness
- Friend → Happiness
- Delivery → Happiness
Change Negative Thoughts

- What kind of thoughts have you had about your tinnitus?
  - Situations where tinnitus is bothersome
  - Thoughts and beliefs about tinnitus
  - Feelings about tinnitus

How to Change Our Reaction to Tinnitus

1. Change Interpretation of Importance
2. Change Emotional Reaction
3. Refocus on Other Activities
4. Reduce Contrast Between Background Sound and Tinnitus
1. Change Interpretation of Importance

- Tinnitus is likely the result of increased spontaneous nerve activity
- Many people have tinnitus – you are not alone
- Tinnitus is not threatening your health or hearing
- Tinnitus and YOUR REACTION to tinnitus are two different things

2. You Can Unlearn/Change Your Emotional Reactions

- Tinnitus → Negative Reaction → Negative thoughts
- Tinnitus → Anxiety, Irritation → Negative thoughts
- Tinnitus → Less Irritation → Constructive thoughts
- Tinnitus → No Reaction → Tinnitus not as prominent
3. Refocus on Other Activities

- What hobbies do you have?
- What activities help you ignore your tinnitus?
- What new activities could you become involved in?

4. Reduce the Contrast Between Tinnitus and Background Sounds
Low level noise makes tinnitus more difficult to detect

Decrease Prominence of Tinnitus
Background sound masks unwanted sounds

Ways to Add Low Level Background Sound

- Listen to recorded material:
  - Relaxation CDs
  - Smartphone apps
  - Nature sounds
  - Music
Do Any Sounds Make Your Tinnitus Less Noticeable?

Rain

Music

Waterfall

Static

PART 5: ACTION PLAN
Activities

1. Practice focusing your attention on your tinnitus, and then on something else
2. Identify alternative activities you enjoy
3. Try different low-level background sounds

Example Tinnitus Diary

1. Write down your thoughts and worries about tinnitus
   - *My tinnitus will get worse over time.*
2. Check to see if these thoughts match what actually happens
   - *Though some days can be worse, my tinnitus is about the same.
3. List the alternative ways of thinking about tinnitus that you find helpful
   - *I have tinnitus, but it is really a small part of my life.*
4. We will discuss your thoughts at your next visit.
Tinnitus Diary, cont’d

1. List the things that reduce your tinnitus
2. List the things that worsen your tinnitus
3. List activities you enjoy
4. List sounds you enjoy
5. List alternative activities to engage in when you find tinnitus bothersome
6. List any low level sounds you used, and their effect on your tinnitus

Example Tinnitus Diary – Week 1

- Make changes in your daily life so you are doing more activities where your tinnitus is better and fewer activities where your tinnitus is worse. List the new activities and how your tinnitus was affected.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Effect on Tinnitus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: Walking</td>
<td>Day 1: Heard birds chirping, did not notice tinnitus</td>
</tr>
<tr>
<td>Day 2:</td>
<td>Day 2:</td>
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<tr>
<td>Day 3:</td>
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<td>Day 6:</td>
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<td>Day 7:</td>
<td>Day 7:</td>
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</tbody>
</table>
Tinnitus Activities Treatment
Hearing and Communication Session

Overview

1. Goals of treatment
2. Hearing and communication difficulties
3. Factors that affect hearing and communication
4. How tinnitus can affect hearing
5. How to improve your hearing
6. Activities for home
1. Goals of Treatment

- Reduce communication difficulties:
  - What difficulties do you have with hearing loss?
  - What difficulties do you have with tinnitus?
- Reduce stress associated with communicating

2. Your Hearing

Understanding your audiogram
Normal Hearing thresholds on an Audiogram

Hearing thresholds after noise exposure
3. Factors that Affect Communication

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

Hearing Loss

- Types of hearing loss:
  - Conductive
  - Sensorineural
  - Mixed
How Hearing Loss Affects Communication

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

Background Noise

- Difficult situation for many people
- Noise covers up speech
- Remove noise source if possible
- Move away from noise or re-position yourself so that the noise source is away from the talker
Ability to See the Talker

- Lip reading
- Facial cues
- Body language

Your Situation!

- What situations cause you difficulty?
- What techniques have you tried to improve your communication?
- What techniques have been successful?
- What techniques have been unsuccessful?
  - Thinking what to say next instead of listening attentively
  - Getting others to communicate for you
4. 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

5. Strategies to Improve Hearing and Communication

1. Use of Amplification
2. Reduce background noise
3. Watch faces
4. Use ‘repair’ strategies
5. Use an effective communication style
Benefits of Hearing Aids

- Better hearing of sounds and speech
- More opportunity to interact in conversation because communication is easier
- Localization of sound—important for safety
- What is your experience with hearing aids?

Watching Faces

- Good lighting
  - Avoid light shining directly behind the talker
  - You need enough light to see talker’s face
- Positioning
  - Face the talker
  - Position yourself close to the talker
  - Minimize noise
  - Minimize visual distractions
Ask the talker to make changes:

- Slow down and speak more clearly
- Face you while talking
- Refrain from chewing gum
- Remove hand from in front of mouth
- Don’t shout

6. Activities

- Keep track of what strategies you use and how they help you hear and communicate better.
  - Can you see the talker’s face?
  - Where was the lighting?
  - Can you move to see the talker’s face?
  - If a new hearing aid user, try to distinguish different sounds.
  - Rehearse repair strategies.
Tinnitus Activities Treatment
Sleep Session

Overview

1. Normal sleep patterns
2. Things that affect sleep
3. Daytime activities to facilitate sleep
4. Evening activities to facilitate sleep
5. Preparing for sleep
6. Waking up at night
7. Waking up in the morning
8. Activities
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. Daytime Activities to Facilitate Sleep

- Avoid napping
  - Don’t modify behavior after a poor night of sleep
- Get regular exercise
  - 3-4 hours prior to sleep
- Lead life as normally as possible, even if tired
4. Evening Activities to Facilitate Sleep

- Create a curfew separating day and night
  - At least 1 ½ hours before bedtime
- After that time, avoid:
  - Stress
  - Exercise
  - Eating
  - Alcohol
  - Caffeine

5. Preparing for Sleep

- Listen to low-level background sound
  - Fan, humidifier
  - Smartphone App
  - CDs, radio
  - Sound generator
- Helpful to control the level
Choose soft, pleasant sounds you enjoy

- Music
  - Calm, soothing, steady, classical
- Sounds of nature
  - Waves, rain
- Broadband noise
  - ‘ssshhh’

Sound and Your Sleeping Partner

- Play sound that you both agree is pleasant
- Use a pillow loudspeaker that only you will hear
- You can go to sleep first listening to sound that turns off with a timer
5. Preparing for Sleep with Relaxation

- Techniques:
  - Progressive muscle relaxation
  - Visual Imagery

**Progressive Muscle Relaxation**

- Learn to systematically tense and relax groups of muscles
- With practice, you will recognize a tensed muscle vs. a relaxed muscle
- This skill allows you to produce physical muscular relaxation at the first signs of tension
Progressive Muscle Relaxation - Practice Exercise

1. Start with your arms
2. Make a fist and tense your arms for 15 seconds
3. Release the tension
4. Breathe deeply and pay attention to the sensation of your arms relaxing

Visual Imagery - Practice Exercise

1. Close your eyes
2. Think of a relaxing scene (the beach)
3. Try to imagine the scene as clearly as you can
4. The smell of the water, warm sand on feet, sound of ocean
5. Allow yourself to relax as you imagine the location in your mind
8. Activities

- What things may be affecting your sleep?
- Could you change your activities or arrange your bedroom differently to improve sleep?

- Utilize the daytime and evening activities to facilitate sleep
- Prepare for sleep using relaxation techniques and background sounds
- Maintain a sleep diary if problems persist

Tinnitus Activities Treatment

Concentration Session
Overview

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

1. Things That Affect Concentration

- The environment:
  - Noise
  - Distractions
  - Temperature
  - Lighting
Your Concentration

- What problems with concentration do you have?
- How do you feel about not being able to concentrate?

2. How Tinnitus Affects Concentration

- We perform best when we focus on one thing at a time
- We can multi-task, but we are less efficient
- When we focus attention to our tinnitus, it is harder to concentrate on other things
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

1. Interpret Tinnitus as Not Important

- Tinnitus is not threatening your health or hearing
- Tinnitus is the result of increased spontaneous activity
- If tinnitus is important, it will be monitored
- When you decide tinnitus is not important, you can begin to not attend to it
3. Stay Focused

- Actively participate
- Take notes
- Ask questions
- Repeat information
- Organize and categorize important points

5. Decrease Prominence of Tinnitus

- Use background sound in the environment

- If you have difficulty concentrating at work, try playing background music or sounds
6. 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 Control Exercises

- Learn to switch attention from one stimulus to another (e.g. object, sensation, thought, activity) at will
- Allows you to refocus your attention from your tinnitus onto other stimuli
Visual Attention Example

- Focus on a nearby object (pen, book)
- Study that object
- Now switch your attention to looking in the distance (e.g. out the window, down the hall)
- Switch back and forth between the two several times
- Notice that you can choose which item you visually pay attention to while ignoring other things around you

Sound Attention Example

1. Listen for a prominent sound around you (e.g. people talking, heater noise)
2. Now listen to a different sound in the room
3. Continue to try and focus on certain sounds while ignoring other sounds around you
Sound and Tinnitus Example

1. Pay attention to a sound in the room (e.g. background music, heater noise, etc.)
2. Now switch your attention to listening to your tinnitus
3. Switch back to listening to the sound in the room and ignore your tinnitus
4. Practice paying attention to other sounds while ignoring your tinnitus

Activities

- Remember to use background sound to make tinnitus less prominent
- Practice attention control exercises
  1. Visual
  2. Sound
  3. Sound plus tinnitus
  4. Sound plus reading
HEARING AIDS FOR TINNITUS

Rich Tyler

Tinnitus population (millions, 2008)

Kochkin, Tyler & Born (2011)
Hearing Aids

Could help tinnitus because:

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

But: HA Fitting with tinnitus patients

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

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
Post Masking Effects of Hearing Aids (and maskers)

• Acoustic stimulation can reduce the magnitude of the tinnitus after the hearing aids are turned off!!!
• Can be for minutes or hours in different patients

1 or 2 hearing aids for tinnitus?

• two hearing aids almost always better hearing
• Increase chance of benefit for tinnitus, even in unilateral tinnitus
  • (Erdman and Sedge, 1981; Coles, 1987)
Hearing aids can make tinnitus worse!!

- Does not happen very often
  - 1 in 100 ???
- During HA use or after removal
- 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

Tinnitus Sound Therapy
Rich Tyler
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)

<table>
<thead>
<tr>
<th>Tinnitus</th>
<th>![Tinnitus]</th>
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</thead>
<tbody>
<tr>
<td>Low Level Noise</td>
<td>![Low Level Noise]</td>
</tr>
<tr>
<td>Tinnitus in Low Level Noise</td>
<td>![Tinnitus in Low Level Noise]</td>
</tr>
</tbody>
</table>

Differences among Sound Therapies

- Level
- Sound quality
- Philosophy
  - Tinnitus or reaction to tinnitus
- Mechanisms
  - Line-busy, brain remapping....
Level of the background sound

- Total masking
  - covers tinnitus completely
  - person hears a ‘masker’ instead of their tinnitus
  - Effective for some
- Partial masking
  - tinnitus and the acoustic sound can be heard
  - reduces the prominence and/or loudness

---

**Complete/Total Masking**

![Diagram showing level of tinnitus and tinnitus masking]
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
“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 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


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
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

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
ONE OR TWO MASKERS?

- If only 1 device
  - Fit worst tinnitus ear first
  - Consider trying both ears
- 2 devices
  - Likely if tinnitus in the head or binaural
  - Might need even with unilateral tinnitus
- try all possible combinations, noting levels that are effective

TINNITUS HEARING-AID MASKER COMBINATIONS

- fit hearing aid first
- add in just the amount of noise needed
- re-adjust hearing aid or start over again if needed
- inform for patient always to turn on hearing aid first
Non-wearable maskers

- Locations
  - Office/workspace/home
  - Bedroom for sleep – leave on all night
    - Including in or under the pillow
- Device options
  - Specialty instrument
    - Plays ocean waves, rain on leaves, etc
  - Music player
    - Radio, cell phone, compact disc player
  - Household appliances
    - Fan, detuned radio

Conclusions

- Wide variety of sound therapies
- Should always be combined with counseling
  - e.g. Tinnitus Activities Treatment
- Low levels partial masking best for most patients
- Preference for quality of sound varies widely across patients (give them options!)
Terminology

- **Loudness Hyperacusis**
  - Some moderately loud sounds are very loud

- **Annoyance Hyperacusis**
  - Some sounds are annoying (not always loud)

- **Fear Hyperacusis**
  - Patients are afraid of some sounds (not always loud)

- **Pain Hyperacusis**
  - Sounds evoke pain sensation
Other Terms

- Hypersensitivity
- Select-sound sensitivity
  - Sensitivity refers to threshold
- Misophonia
  - Dislike of sounds

Less confusion if

- Choose simple terms with clear distinct definitions
- Avoid temptation for everyone to make up new terms
Terminology

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- **Pain Hyperacusis**
  - Sounds evoke pain sensation

Hearing Aids

- Hearing aids (with closed canal earmolds) can reduce sound by (at most) ~ 30 dB
- Reduce maximum output of hearing aids so that high level sounds are peak-clipped or compressed
- Adjust input/output (gain) so that low-level sounds are amplified, but not high-level sounds
- Followed by gradual transition (over months) to ‘normal’

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Sound Therapy Treatments

- Hazell & Sheldrake (1989, 1992)
  - Continuous bilateral exposure to low level background noise
  - Gradual exposure to noise, 2 hours/day under earphones
- Tyler et al. (2000, 2009)
  - Successive approximations of individual bothersome sounds

Tyler et al. (2000, 2009)

- Record specific sounds bothering an individual
- Play sounds at low level under controlled, peaceful environment
- Over time, increase level and duration
- Use successive approximation to move toward actual realistic situation where bothersome sounds occur