Tinnitus and Hyperacusis Activities
Treatment: In-person and remotely-delivered intervention to help our patients

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• Drs. Richard Tyler (Iowa)
• Student researchers
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Agenda

1. Introduce Tinnitus Activities Treatment and discuss group educational sessions
2. Discuss sound therapy interventions, smartphone Apps, neuromodulation
3. Apply Tinnitus Activities Treatment to clinical cases
4. Describe results from TAT-Online research study
5. Review Hyperacusis Activities Treatment and HAT-Online research study results
Tinnitus is Common

- 14.4% of people worldwide have tinnitus (Jarach et al., 2022)
- 24% of people over 65 years old have tinnitus (Jarach et al., 2022)
- About 20% of people with tinnitus require clinical intervention (Henry et al., 2008)
Multiple Causes of Tinnitus
(Tunkel et al, 2014)
How We Attend and React to Sounds
(Gander & Tyler, 2022)

Amygdala
(emotions)

Auditory cortex
(interpretation, memory)

Autonomic nervous system
(automatic 'fight or flight' responses)

Auditory brainstem
(subconscious monitoring)

Auditory periphery
(coding of sound)
(initiation of neural representation)
Problems resulting from tinnitus  
(Tyler & Baker, 1983)

1. Depression, Anxiety
2. Difficulty understanding speech/hearing
3. Insomnia
4. Impaired concentration
Tinnitus Activities Treatment

• Developed by Dr. Richard Tyler in 1980s
  • Provide informational counseling on tinnitus and related problems,
  • Suggest coping strategies
  • Recommend partial masking for tinnitus

Background on Tinnitus Activities Treatment

• Key principles:
  1. Nurture patient expectations
  2. Provide counseling using pictures (Tyler & Bergan, 2001)
  3. Implement a patient-centered approach to care

• We begin tinnitus counseling by
  1. Identifying three patient-centered goals (e.g., COSIT; Dillon et al., 1997)
  2. Administering the Tinnitus Primary Functions Questionnaire (TPFQ; Tyler, Perreau, & Ji, 2014)
  3. Providing an introductory session to Tinnitus Activities Treatment
Client Oriented Scale of Improvement in Tinnitus - COSIT

- Open-ended questionnaire to assess most important problems experienced by patient
- Identify three patient-centered goals for therapy
- Searchfield, 2019

<table>
<thead>
<tr>
<th>Specific Needs</th>
<th>Degree of Change</th>
<th>Final Result in Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Reducing tinnitus' effects on hearing</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>2) Improved wellbeing, being less depressed</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>3) Coping with or controlling the tinnitus</td>
<td>1 2 3 4 5</td>
<td>1 2 3 4 5</td>
</tr>
</tbody>
</table>
Tinnitus Primary Functions Questionnaire (Tyler et al., 2014)

- 12 item version
- Determine the impact of tinnitus on everyday activities
  - 1) Emotions, 2) Hearing, 3) Sleep, 4) Concentration
- Administer before and after therapy

<table>
<thead>
<tr>
<th></th>
<th>0-Completely Disagree to 100-Completely Agree</th>
<th>Subscale</th>
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<td>My tinnitus, not my hearing loss, interferes with my appreciation of music and songs.</td>
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Patient Example: TPFQ results

- Conc = 75
- Thoughts and Emotions = 41.7
- Hearing = 58.3
- Sleep = 0
- Total TPFQ score = 43.75%

Please indicate your agreement with each statement on a scale from 0 (completely disagree) to 100 (completely agree).

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Your Rating (0-100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel like my tinnitus makes it difficult for me to concentrate on some tasks.</td>
<td>75</td>
</tr>
<tr>
<td>2</td>
<td>I have difficulty focusing my attention on some important tasks because of tinnitus.</td>
<td>75</td>
</tr>
<tr>
<td>3</td>
<td>My inability to think about something undisturbed is one of the worst effects of my tinnitus.</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>My emotional peace is one of the worst effects of my tinnitus.</td>
<td>50</td>
</tr>
<tr>
<td>5</td>
<td>I am depressed because of my tinnitus.</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>I am anxious because of my tinnitus.</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>My tinnitus masks some speech sounds.</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>In addition to my hearing loss, my tinnitus interferes with my understanding of speech.</td>
<td>75</td>
</tr>
<tr>
<td>9</td>
<td>One of the worst things about my tinnitus is its effect on my speech understanding, over and above any effect of my hearing loss.</td>
<td>50</td>
</tr>
<tr>
<td>10</td>
<td>I am tired during the day because my tinnitus has disrupted my sleep.</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>I lie awake at night because of my tinnitus.</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>When I wake up in the night, my tinnitus makes it difficult to get back to sleep.</td>
<td>0</td>
</tr>
</tbody>
</table>
### Measuring Reactions to Tinnitus

**Established questionnaires**
- Tinnitus Questionnaire
- Tinnitus Handicap Questionnaire
- Tinnitus Reaction Questionnaire
- Tinnitus Handicap Inventory
- Tinnitus Functional Index
- Tinnitus Primary Functions Questionnaire

**Open-ended**
- Tinnitus Problems Questionnaire
- Client Oriented Scale of Improvement in Tinnitus (COSIT)

**Other**
- Patient Diary
- Tinnitus intake questionnaire (U of Iowa)

### Measuring Tinnitus

**Psychoacoustic Measures**
- Pitch matching
- Loudness matching
- Minimum masking level (MML)
- Residual inhibition

**Tinnitus Magnitude Estimation**
- Tinnitus qualities rated using a numerical, categorical, or visual analog scale

### Measuring Quality of Life

**Generic**
- EQ-5D
- SF-36
- WHO DAS 2.0
- Meaning of Life

### Measuring Related Problems

**Specific**
- Beck Depression Inventory
- State-Trait Anxiety Inventory
- Pittsburgh Quality Sleep Index
- Insomnia Severity Index

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Perreau, Mancini, & Tyler, 2022
Levels of tinnitus patients and proposed treatment (Tyler et al., 2008)

<table>
<thead>
<tr>
<th>Patient</th>
<th>Overall goal</th>
<th>Focus areas</th>
</tr>
</thead>
</table>
| Curious  | Initial contact | Listen to the patient  
Provide **hearing aid referral** if necessary  
Provide **general information** about the background and treatment of tinnitus  
Determine if further treatment or referral is needed |
| Concerned | Preliminary counseling | Listen to the patient  
Provide more detail about **tinnitus models and treatment**  
Assess individual **needs**  
Provide plan for **self-treatment**  
Determine if further treatment or referral is needed |
| Distressed | Tinnitus assessment and treatment | Listen to the patient  
Assess **tinnitus severity** using established instruments  
Measure **psychoacoustic characteristics** of tinnitus  
Assess **psychological well-being and determine if referral is needed**  
Provide information about treatments  
**Assess treatment plan options** and decide on treatment(s) |
Step 1
- Medical Consultation
- Hearing test

Step 2
- Group Session

Step 3
- Counseling
- Sound therapy devices
- Counseling and sound therapy devices

Step 4
- Individual tinnitus evaluation
Start with a Group Educational Session

- A single session is led by an audiologist or qualified healthcare provider!
- A great way to promote services
- Facilitate discussion, provide information, and encourage sharing among attendees
- Appropriate for all levels of tinnitus patients, from curious to distressed
Group session - Hearing mechanism

• The Human Auditory System:

Peripheral system
- Outer ear
- Middle ear
- Inner ear

Central system
- Conductive mechanism
- Sensory mechanism
- Central mechanism
Group session - Reactions to tinnitus

• Thoughts and emotions
• Hearing difficulties
• Sleep
• Concentration
Group discussion - For those with tinnitus

• What is the most difficult thing to explain to others about tinnitus?

• What could others do to help you with your tinnitus?
Group discussion - For partners of someone with tinnitus

• What have you been able to do to help your partner with their tinnitus?
Group discussion - Treatments for tinnitus

• What have you tried?

• What has been successful?
Group session – Expectations for relief

• At this time, there are no widely accepted cures for tinnitus

• There are no studies that have shown a cure for tinnitus
  – None using appropriate research designs and that have been replicated by others
How do you want to manage your tinnitus?

1. Focus on other areas of your life and put tinnitus in the background
2. Use low level sound in your environment (sound machine, CDs, App, television, etc)
3. Seek medical and/or audiological evaluation of tinnitus
4. Use wearable tinnitus devices
5. Use hearing aids with maskers for hearing loss
6. Begin individualized counseling
Step 1
- Medical Consultation
- Hearing test

Step 2
- Group Session

Step 3
- Counseling
- Sound therapy devices
- Counseling and sound therapy devices

Step 4
- Individual tinnitus evaluation
Tinnitus Activities Treatment (TAT) Components (Tyler et al, 2009)

1. Counseling
   - Thoughts and Emotions
   - Hearing and Communication
   - Sleep
   - Concentration

2. Sound Therapy
   - Decrease the neural prominence of the tinnitus
   - Mask the unwanted tinnitus sound
   - Make tinnitus less noticeable
1. Thoughts and Emotions

- Hearing, hearing loss, and tinnitus
- Attention, behavior, and emotions
- Changing your reactions to tinnitus
Connecting our Thoughts and Emotions

Doorbell

Neutral

Doorbell

Fire

Injury

Angry neighbor

Anxiety

Doorbell

Flowers

Friend

Delivery

Happiness
Things That Capture Our Conscious Attention

- Unexpected
- Unusual
- Scary
- Important
Tinnitus and attention

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

If brain determines **tinnitus is not important**, the tinnitus can be ignored.
How to change reactions to tinnitus

1. Change interpretation of importance

Tinnitus and YOUR REACTION to tinnitus are two different things

2. Change emotional reaction

I hate this noise → I can learn to live with this noise

3. Refocus on other activities

Engage in hobbies, activities to focus away from tinnitus
A Tinnitus Diary

- Neutralize negative thoughts about tinnitus
- Modify your lifestyle to engage in enjoyable activities
- Use low-level background sound to make tinnitus less prominent
- Discontinue use after 2 weeks to focus away from 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
Tinnitus Activities Treatment Components (Tyler et al, 2009)

1. Counseling
Thoughts and Emotions
Hearing and Communication
Sleep
Concentration

2. Sound Therapy
Decrease the neural prominence of the tinnitus
Mask the unwanted tinnitus sound
Make tinnitus less noticeable
Decrease Prominence of Tinnitus
Expectations for Tinnitus Relief using Sound Therapy

You hear background sound

Background sound has no emotional importance

You get used to background sound plus tinnitus
Sound Therapy Options

• Non-wearable sound generators
  • Sound Pillow
  • Sound Generators
  • Smartphone Apps
  • CDs, radio, etc

Tinnitus Relief App: https://www.youtube.com/watch?v=9crPCB7qfBY
Wearable tinnitus devices

- General Hearing Instruments
- Neuromonics
- Desyncra
- Phonak
- Resound
- Signia
- Starkey
- Widex
Neuromod Lenire tinnitus device

- Offers bimodal tongue and auditory stimulation over 3 months of use
Hearing Aids

- Improve hearing and communication
- Reduce stress of effortful listening
- Facilitate positive reactions to tinnitus
- Mask the tinnitus sound
- Often based implemented with sound generator capabilities
Apps for Tinnitus
(Perreau et al., 2022)

Assessment of tinnitus
- Screening
- Questionnaires

Management of tinnitus
- Counseling
- Sound therapy

Education & Information
- Tutorials and basic information
- Sound level meter apps

Assistive tools for Wellness
- Meditation
- Mindfulness
- Relaxation
Sound Therapy Apps for CI Patients with Tinnitus

Perreau, Tyler, Frank Watts, & Mancini (2021)
Results - Sound Therapy Apps for CI Patients (Perreau et al., 2021)

• Sound therapy from the Resound Relief App is acceptable, though the effective sound will vary across CI users

• Sound therapy is effective in reducing tinnitus loudness, even with a short-term exposure

• Speech recognition abilities are not significantly different before and after sound therapy

• Large individual differences are observed among participants, and not all CI users will benefit from sound therapy via an App
Sound Therapy Recommendations

• Background sound should be neutral and reduce the prominence of tinnitus
• Does not completely cover up tinnitus
• Can use a variety of different sources
• Recommend 2-3 hours of use
Effectiveness of Tinnitus Activities Treatment from a Clinical Case
Case study: 55-year-old female with bilateral tinnitus

History of brain injury following MVA that affected occipital lobe. After 2nd brain surgery, she noticed tinnitus

Saw ENT → Completed a hearing test, recommended hearing protection and masking

Referred for tinnitus counseling
Tinnitus plan

1. Completed a hearing and tinnitus intake questionnaire, and the TPFQ to determine reactions to tinnitus
2. Attended our group educational session
3. Determined goals of therapy using COSIT:
   • *Confusing tinnitus sound with hearing environmental sounds (alarms)*
   • *Difficulty focusing while doing tasks*
   • *Frustration that the tinnitus is always there*
Thoughts and emotions

- Reports that tinnitus is annoying and bothersome when tired or stressed.
- Her thoughts about tinnitus were negative: I can’t live with this noise!
- Completed a tinnitus diary over 2 weeks to identify thoughts about tinnitus and activities that are helpful in relieving tinnitus.

Sound therapy

- Listened to radio. Used a white noise machine and smartphone app for tinnitus relief.
- Fit bilateral open-fit RIC hearing aids with Brownian noise and provided counseling on sound generator use.
Case study: Outcome after therapy

TPFQ results

<table>
<thead>
<tr>
<th></th>
<th>Pre-therapy</th>
<th>Post-therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conc.</td>
<td>75</td>
<td>0</td>
</tr>
<tr>
<td>Th. Em.</td>
<td>41.7</td>
<td>0</td>
</tr>
<tr>
<td>Hearing</td>
<td>58.3</td>
<td>0</td>
</tr>
<tr>
<td>Sleep</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- **TPFQ**: Significant reduction in scores for conc, thoughts + emotions, and hearing
- **COSIT**: After therapy, all problems were much better: hearing environmental sounds, focus, and tinnitus awareness
- **Overall**, she was very pleased with the sound therapy trial
Summary

• A brief overview of tinnitus, reactions to tinnitus and helpful treatments is sufficient for many curious/concerned patients.

• For patients who are distressed by tinnitus, counseling will be needed to address their concerns. TAT sessions can be modified to fit their needs and questionnaires should be used to track progress.

• Most patients can complete TAT counseling in 3-4 sessions, each lasting about 1 hour and separated by ~2 weeks.
A Study of the Acceptability and Effectiveness of Remote Counseling for Tinnitus
Rationale for remote tinnitus counseling

• Potential to address patient concerns
  • Lack of knowledgeable professionals
  • High cost of appointments
  • Need for multiple appointments
• Previous studies suggest internet-based CBT reduces tinnitus distress and increases quality of life (e.g., Beukes et al., 2018; Gans et al., 2022)
TAT-Online Weekly Topics

Week 1: Introduction to Tinnitus
Week 2: Thoughts and Emotions
Week 3: Sleep
Week 4: Hearing
Week 5: Concentration
Week 6: Relaxation Techniques and Sound Therapy

Sources: Andersson & Kaldo (2004); Beukes et al. (2018)
Examples of TAT-Online Educational Videos

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

Sound Therapy Recommendations

- Choose a low-level background sound
- Sound should reduce the loudness and prominence of the tinnitus
- Sound should not completely cover up tinnitus
- Does not need to be present constantly
Homework - Reflect on your concentration abilities...

- Do you experience problems with concentration?
- Which situations cause you the biggest problems with your concentration?
- How do you feel about not being able to concentrate or focus well?
Example quiz responses - Concentration

True or False: You can use background noise to make tinnitus less prominent? 85 / 86 correct responses

- True: 85 (98.8%)
- False: 1 (1.2%)

Which of the following is NOT a strategy explained in the video that improves concentration with music?
73 / 86 correct responses

- Interpret tinnitus as not important: 6 (7%)
- Tune Out: 73 (84.9%)
- Eliminate Distractions: 2 (2.3%)
- Adjust work strategies: 5 (5.8%)
Study Aims

- To develop a remote counseling program for tinnitus that is accessible and user friendly
- To demonstrate effectiveness of remote counseling in reducing tinnitus severity and related problems
Methods
Recruited 316 adults with chronic tinnitus

Enrolled 243 adults in TAT-Online (76.9% met criteria)

170 adults partially completed study (70%)

73 adults completed study (30%)
Participant Demographics (n=73)

- Mean age = 62.1 yrs (19-77 yrs); 40 females
- All English speakers, Ethnicity = Caucasian for 37, 1 Multiracial
- Occupations: 39=retired, 5 = teacher, 3 = engineering

<table>
<thead>
<tr>
<th>Tinnitus Characteristic</th>
<th>Mean (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinnitus duration</td>
<td>14.8 yrs (0.33-50)</td>
</tr>
<tr>
<td>Tinnitus pitch (100 = very high)</td>
<td>76.62 (1-100)</td>
</tr>
<tr>
<td>Tinnitus loudness (100 = very loud)</td>
<td>70.5 (25-100)</td>
</tr>
<tr>
<td>Tinnitus annoyance (100=extremely annoying)</td>
<td>67.3 (0-100)</td>
</tr>
</tbody>
</table>
TAT-Online Protocol

1. Complete initial questionnaires at week 0
2. View video-recorded counseling sessions for 6 weeks
3. Complete homework activities and quizzes each week
4. Readminister questionnaires at week 7

- Tinnitus Handicap Questionnaire
- Tinnitus Primary Functions Questionnaire
- Ratings of Loudness/Annoyance
- Meaning of Life Questionnaire
1. Tinnitus Handicap Questionnaire (Kuk, Tyler, et al., 1990)

- Assesses physical, emotional, and social consequences of tinnitus, and hearing changes
- Includes 27-items that can be completed quickly
- Has high reliability (0.94)

<table>
<thead>
<tr>
<th></th>
<th>0 if you strongly disagree (up to) 100 if you strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I do not enjoy life because of tinnitus.</td>
</tr>
<tr>
<td>2.</td>
<td>My tinnitus has gotten worse over the years.</td>
</tr>
<tr>
<td>4.</td>
<td>I am unable to follow the conversation during meetings because of tinnitus.</td>
</tr>
<tr>
<td>5.</td>
<td>Tinnitus causes me to avoid noisy situations.</td>
</tr>
</tbody>
</table>
2. Tinnitus Primary Functions Questionnaire (Tyler, Perreau, Ji, 2014)

- 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

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<td>9.</td>
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<td>Hearing</td>
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3. Tinnitus magnitude estimations (Tyler et al, 2006)

• Assessed tinnitus loudness and annoyance using single-item ratings or magnitude estimations:

<table>
<thead>
<tr>
<th>Description</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Describe the <em>LOUDNESS</em> of your tinnitus using a scale from 0-100. <em>(0 = VERY FAINT; 100 = VERY LOUD)</em></td>
<td>_______ (0-100)</td>
</tr>
<tr>
<td>Describe the typical <em>ANNOYANCE</em> of your tinnitus using a scale from 0-100. <em>(0 = NOT ANNOYING AT ALL; 100 = EXTREMELY ANNOYING)</em></td>
<td>_______ (0-100)</td>
</tr>
</tbody>
</table>
Results
Acceptability of TAT-Online program

- Self-rating effectiveness averaged 70%
- 96% (56/58) of participants reported the 6-week duration and videos were adequate length
- 98% (57/58) of participants would recommend study to others
- Great suggestions: more on habituation, more on relaxation and mindfulness, book recommendations, add a group forum or meeting, info on hearing aids
1. Tinnitus Handicap Questionnaire

- Tinnitus severity improved from 44.5 to 36.1 which was significant for the group and of moderate effect size (p<.001, d = .620)
- High variability in scores, normally distributed (SD=18.5)
2. Tinnitus Primary Functions Questionnaire

- Significant improvement in Concentration and Thoughts by 12-14% ($p<.001, d = .596$ for conc, $d = 5.10$ for thoughts)
- $41/71$ showed a significant improvement in Concentration
3. Tinnitus annoyance ratings (n=71)

- Ratings significantly improved by 11% to 55.7/100 after treatment with moderate effect size (p<.001, d = .514)
- Loudness rating significantly improved by 6% to 61.2/100 (p=.007)
Conclusions from TAT-Online study

Remote, self-paced tinnitus counseling provides a general basis for education about tinnitus and how to cope with it.

Visual and auditory teaching is beneficial to the user's experience and learning.

TAT-Online is effective in reducing reactions to tinnitus for many patients.

Research should continue to investigate use of remote counseling for tinnitus including long-term effectiveness with sound therapy.
Hyperacusis
Activities
Treatment
What is hyperacusis?

- Reactions to moderately-loud sounds are too loud, annoying, fearful, and/or painful (Tyler et al., 2014)
- Affects 6-17% of general population (Andersson, 2002)
- Other terms that are used:
  - Misophonia
  - Select Sound Sensitivity
  - Decreased Sound Tolerance
Types of hyperacusis

Loudness hyperacusis

Annoyance hyperacusis

Fear hyperacusis

Pain hyperacusis
Common reactions to hyperacusis: Loudness, annoyance, fear, and pain
Sounds that are too loud

Which of the following sounds or events are often too loud for you?

Data from University of Iowa, Tyler
Sounds that are annoying

Data from University of Iowa, Tyler
Sounds that are fearful

Data from University of Iowa, Tyler
Sounds that cause pain

Data from University of Iowa, Tyler
Hyperacusis and related symptoms
(Aazh, & Moore, 2018; Greenberg, & Carlos, 2018; Ke et al, 2020)

- Headaches
- Light sensitivity
- Smell disturbances
- Taste disturbances
- Anxiety
- Depression
- Psychosocial impairments
- Functional impairments
Management of Hyperacusis

1. **Ear plugs** to reduce sound exposure (Pienkowski et al, 2014)

2. **Counseling** that includes Cognitive Behavioral Therapy (Juris et al., 2014) and mindfulness

3. **Sound therapy** to improve loudness perception (Formby & Gold, 2002)

4. **Medications** such as serotonin receptor inhibitors (Gopal et al., 2000) and for anxiety
Documenting Problems from Hyperacusis using Open-ended Questionnaires
## Methods - Participants

n=26

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>Average (range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>15 M; 11 F</td>
</tr>
<tr>
<td>Age in years</td>
<td>63.8 (19-93)</td>
</tr>
<tr>
<td>Duration in years</td>
<td>4.1 (.1-25)</td>
</tr>
<tr>
<td>Location of hyperacusis</td>
<td>84% in both ears</td>
</tr>
<tr>
<td>Causes of hyperacusis</td>
<td>Unknown (n=12); noise exposure (n=3), infections (n=3), accidents (n=3), Meniere’s (n=1), age (n=1), head injury (n=1) and medications (n=1)</td>
</tr>
<tr>
<td>Presence of hearing loss</td>
<td>60% had mild HL or better</td>
</tr>
<tr>
<td>Presence of tinnitus</td>
<td>73%</td>
</tr>
<tr>
<td>Severity of hyperacusis (0-100 rating)</td>
<td>82.9% (20-100)</td>
</tr>
</tbody>
</table>
Hyperacusis Problems Questionnaire

- 131 problems reported in total with an average of 5.5 per patient

Figure 1. Percentage of problems experienced by hyperacusis based on category of reaction

- 37.40% Bothersome sounds (n=49)
- 29.77% Emotional wellbeing (n=13)
- 12.21% Physical symptoms (n=16)
- 10.69% Functional impairments (n=14)
- 9.92% Social impairments (n=39)
Common problems reported by Hyperacusis patients

<table>
<thead>
<tr>
<th>Category</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bothersome sounds</strong></td>
<td>- Loud voices; TV, radio, movies; traffic noise; lawnmowers; wear earplugs/muffs</td>
</tr>
<tr>
<td><strong>Social impairments</strong></td>
<td>- Avoiding groups/ friends/ family; unable to attend sporting events; avoid social situations</td>
</tr>
<tr>
<td><strong>Physical symptoms</strong></td>
<td>- Ear pain; headaches; dizziness; feeling nauseous</td>
</tr>
<tr>
<td><strong>Functional impairments</strong></td>
<td>- Unable to do work; focusing on tasks; school is unbearable</td>
</tr>
<tr>
<td><strong>Emotional wellbeing</strong></td>
<td>- Anxiety; depression; frustration/anger; annoyed by others and sounds</td>
</tr>
</tbody>
</table>
Results after using Hyperacusis Activities Treatment

- Number of problems from hyperacusis significantly decreased from 5.6 to 3.2 ($t(19)=2.902; p=.009$)
- Comparing the change in hyperacusis symptoms over time, 60% of the patients reportedly were better; 20% were same and 20% were worse.

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

**Sound Therapy**
- Improve sound tolerance or loudness perception
- Mask bothersome sounds
Results after using Hyperacusis Activities Treatment

• Most problems were reportedly better after therapy on COSI-H
Conclusions - hyperacusis

1. The most common problems were related to the bothersome sounds that patients are exposed to, followed by social impairments or avoidance of social situations

2. Hyperacusis Activities Treatment reduced the number of problems experienced by patients and improved their overall functioning

3. More research is needed to evaluate outcome measures for hyperacusis with a larger patient population
Introducing Hyperacusis Activities Treatment - Online!

Do you qualify?
We are recruiting adults with hyperacusis to complete a remote counseling and sound therapy program. It is a clinical trial sponsored by the National Institutes of Health.

What will I do in the study?
Participation in the clinical trial is expected to last 12 weeks. You will be asked to complete activities each week. Activities include:
- Watching short, instructional videos
- Completing homework and logs
- Answering short quizzes
- Listening to sounds with provided headphones and tablets or sound generators.

What are the goals of Hyperacusis Activities Treatment-Online?
- To review the causes, prevalence, mechanisms of hyperacusis, and reactions to hyperacusis
- To provide education and review strategies for concentration, sleep, thoughts and emotions, and communication
- To use a sound therapy device to help reduce your hyperacusis

How do I enroll?
To enroll, please use the QR code shown to the right. You will complete the informed consent and screening forms online at our HEAR-T (Hearing +Tinnitus) lab website.

For any questions, please contact Dr. Ann Perreau at annperreau@augustana.edu.
IRB Approval #: 1043205468
HAT-Online Counseling Plan

You will participate over 4 weeks using this schedule:

**Week 1**
Introduction to HAT-Online!
Education about the causes and mechanisms of hyperacusis, hearing and hearing loss.

**Week 2**
Reactions to hyperacusis
Discuss common reactions to hyperacusis and taking volitional control of one's attention.

**Week 3**
Thought analysis and restructuring
Learn about unhelpful thoughts and how to change these into healthy thoughts.

**Week 4**
Sound therapy and relaxation
Describe sound therapy options to help hyperacusis and demonstrate relaxation exercises.
HAT-Online Weekly Activities

Videos
- Watch 2-3 videos on topic for that week

Hands-on
- Complete hands-on activities and reflection of your experiences with hyperacusis

Forum
- Attend a weekly discussion forum facilitated by Drs. Perreau and Williamson

Resources
- Review 1-2 handouts that review topics and provide additional resources

Quiz
- Complete a 10-item quiz that assesses knowledge gained from the week
HAT-Online Sound Therapy Treatment Protocol

- Compare Effectiveness of 2 Different Sound Therapy Approaches

**Group 1**
- Listen to Bothersome Sounds
- Sounds are selected individually
- Tyler et al., 2015

**Group 2**
- Use White Noise Sound Generators
- Fit devices remotely
- Formby et al., 2007, 2015

- Participants listen to sounds daily using a customized protocol
- Participants track their progress using a diary
Wrap up and Assessment
1. True or False: Tinnitus is rare and observed in less than 1% of adults.
2. "I can't live with this noise in my head!" is an example of what kind of thought?

• Neutral
• Negative
• Positive
3. True or False: You should use a high-level background sound when trying to make your tinnitus less noticeable.
4. Which of the following can make your tinnitus less noticeable?

- Rain
- Static noises
- Music
- All of the above
5. Which of the following is a NOT subtype of hyperacusis?

- Fear
- Annoyance
- Tinnitus
- Loudness
References

References, cont’d


References, cont’d

Questions?

annperreau@augustana.edu