Tinnitus and Trauma: Challenges for Patients and Providers

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Tinnitus and Posttraumatic Stress: Patient and Provider Priorities
1. Review of trauma and stress: traumatic brain injury, posttraumatic stress “disorder” and their association with tinnitus
2. Traumatic memory and tinnitus
3. Lessons from Cognitive-Behavioral Therapy
4. Two “audiologist-friendly” strategies for use in the clinic (self-efficacy and hearing aids)
5. Presentation of a case from the clinic

At-Risk Populations
- Civilian
  - Victims of sexual abuse/sex trade
  - Domestic violence
  - Motor vehicle accident survivors
  - If trauma inflicted prior to 10 years of age, victim is more likely to develop PTSD later in life
- Military
  - Combat trauma (either as perpetrator, victim, or observer)
  - Blast survivors (w/ mTBI)
  - Childhood trauma victims
- Victims of Captivity (whether military or civilian)

Traumatic Brain Injury

Occurrence across the globe:
Persons affected/100,000 (www.ptsd.va.gov)
Traumatic Brain Injury (TBI) & Blasts

- Traumatic Brain Injury: Data from CDC
  - 1.4 million cases/year in US
  - Fatal in 50,000/yr.
  - Approx. 235,000 hospitalized
  - Known as risk factor increasing probability of Alzheimer’s, epilepsy, Parkinson’s
  - 5.3 M Americans with permanent effects
  - 110,392 pts w/ at least one closed head injury
  - Approx. 8-11/1000 active military affected

Traumatic Brain Injury (TBI)

- Traumatic Brain Injury: Association with psychological conditions
  - 80% display mild symptoms w/ return to ‘normal’ 3-6 mos. following trauma
  - Amnesia may protect from intrusive memories
  - 10-25% of all trauma patients, regardless of severity, develop longer-term symptoms
    - Somatic/sensory (headache, tinnitus, insomnia, etc.)
    - Cognitive (memory, attention and concentration difficulties)
    - Emotional/behavioral (irritability, depression, anxiety)

Traumatic Brain Injury (TBI)

- Blast Injuries (reviewed by DePalma et al., NE J. of Med, 2005; CDC, 2007)
- Primary effects (related to barotrauma):
  - TM perforation most common effect
  - Increase of 5 psi (above 14.7 psi) sufficient to perfor TM in 50% of exposures (IEDs produce up to a 60 psi increase in pressure, usually w/in 2.5-50 ms)
    - If TM is not perforated, there will typically be no other primary blast effects
  - Pulmonary and visceral ruptures also common

Traumatic Brain Injury (TBI)

- Secondary effects:
  - Penetrating trauma and fragmentation injuries
    - Caused by fragments from the weapon
    - Or fragments from whatever was hit
    - Primary cause of death from blasts unless…
- Tertiary effects:
  - Building collapse, crush injuries, blunt trauma, etc.; injuries associated with bodies launched from the ground or vehicles

Tinnitus Risk in the Military: Traumatic Brain Injury (TBI)

- Blast Injuries (reviewed by DePalma et al., NE J. of Med, 2005; CDC, 2007)
- Quaternary effects:
  - Burns
  - Asphyxiation
  - Exposure to toxic inhalants or other toxins in the environment (ie., asbestos)
- Quinary effects:
  - Exposure to chemicals deliberately added to explosive device
Audiologic Consequences of Blast Exposure: Myers et al., 2009

• Outer ear
  - Burns, amputation of (parts of) pinna, infection from contaminated debris

• Middle ear (in addition to TM perf)
  - Ossicular discontinuity/fracture in up to 33% of cases
  - Cholesteatoma resulting from epithelial cells forced through perforated TM (8% of exposures) and may recur

• Inner ear
  - Damage both from the blast wave and the ensuing SPL (hearing loss maybe conductive, mixed, or SN)
  - Blast wave produces physical damage to membranes
  - Hearing protection works but is not always used, up to 75% of exposed pts develop hearing loss, 40% tinnitus

Traumatic Brain Injury: Association with psychological conditions

• Time Course and sequelae (Deployment Health Clinical Center)
  - Symptoms may appear immediately after the injury or appear days or weeks later
  - 80% display mild symptoms w/ return to ‘normal’ 3-6 mos. following trauma
  - Amnesia may protect from intrusive memories
  - 10-25% of all trauma patients, regardless of severity, develop longer-term symptoms
    - Somatic/sensory (headache, tinnitus, insomnia, etc.)
    - Cognitive (memory, attention and concentration difficulties)
    - Emotional/behavioral (irritability, depression, anxiety)

Traumatic Brain Injury (TBI)

• Traumatic Brain Injury: Association with psychological conditions (Brain Injury Assoc. of America)
  - Approx. 6% of Americans suffer significant depression at some point in their lives
  - Nearly ten times that number experience at least one episode of severe depression while recovering from a traumatic head injury

Traumatic Brain Injury: Summary

• Blast noise may produce substantial inner ear and conductive system damage (perfs, disarticulation, hair cell loss, skull fracture)
• The blast may produce widespread cortical/cerebellar damage due to penetrating and/or blunt trauma (VIIIth nerve section, diffuse axonal destruction)
• Patients more likely than non-exposed individuals to develop psych disorder such as PTSD or depression
• Such psych disorders shown to exacerbate tinnitus severity and symptoms
• Therefore, expect that head trauma victims, in spite of other more urgent health care and psych needs may also experience severe tinnitus (audiologist on the polytrauma team)

PTSD Changes People and Character

• Judith Herman (1997) quotes a victim (in this case, of captivity):
  - “All those norms of human behavior which are inculcated in one from the cradle are subjected to deliberate and systematic destruction. You will have to strain all your inner resources to remember that there is…another reality…Only by maximum exertion of will is it possible to retain one’s former, normal scale of values.” (Trauma and Recovery; p. 77-78)
  - The more pronounced and longer in duration the captivity/trauma, the more likely one loses the struggle to retain their sense of value, or their character
PTSD: Perpetrator, Victim, Witness

- Jonathan Shay (1994) comments on the perpetrator of trauma experiencing PTSD:
  - Violation of “what is right” or social/moral order (whether in families or the military) “inflicts manifold injuries” on the victim
  - Example: Veteran’s story of being ordered to fire upon boats landing in the middle of the night, finding out in the morning that the victims were children and fishermen. The officers and company received high honors for the action (body count) and were praised for having been “blooded” by the experience
  - As in a family abuse situation, violation of a moral order affects the most vulnerable most profoundly (children/foot soldiers)
- Consider also Lifton’s interviews w/ Nazi Doctors

Posttraumatic Stress Disorder

- Origins of the PTSD diagnosis (see Herman, 1997 for review, examples, definitions, etc.)
  - Hysteria – abuse victims, captives (from Breuer, Charcot, Freud, others; late 1800s-early 1900s)
  - Shell-shock, Combat fatigue – combat veterans (early references from Civil War continue through both Gulf Wars)
  - Kardiner (1947) coined the term physisoneurosis to describe chronic arousal of the autonomic NS observed in WWII veterans

PTSD Changes People and Character

- With regard to CNS and auditory function:
  - Produces a ‘baseline change in CNS activity’ (Herman, 1997) as measured on EEG
  - Provokes sensation of chronic hypervigilance and hyperawareness of one’s surroundings
  - Affects sleep, concentration, digestion, emotional state
  - Resulting exaggerated startle response causes stress, exacerbates tinnitus loudness (ie., reactive tinnitus), and raises anxiety level

Tinnitus with Co-morbid PTSD from Mtn. Home Clinic

- Expected complications (from experience, training, literature)
  - Psychological – increased likelihood of depression, anxiety, irritability, sense of isolation, suicide ideation
  - Physical – chronic fatigue, chronic pain, increased incidence of RA, diabetes, HBP, etc.
  - Auditory – sound tolerance problems, exaggerated startle, concentration/attentional deficits
- Unexpected complications
  - Influence/prevalence of sudden-onset tinnitus
  - Increased likelihood of ‘reactive’ tinnitus
  - Also unexpected was the influence of tinnitus on PTSD (Hinton et al., 2006)

PTSD: Behavioral Diagnostic Markers

- As defined in the Diagnostic and Statistical Manual of the APA (DSM-V; 2013), the criteria for a diagnosis of PTSD include:
  - A: Exposure to traumatic stressor
  - B: Re-experiencing symptoms (flashbacks; acknowledges considerations for at-risk children)
  - C: Avoidance and numbing symptoms split in new version:
    - A: Exposure to traumatic stressor
    - B: Re-experiencing symptoms (flashbacks; acknowledges considerations for at-risk children)
  - D: Cognitive distortions and mood changes related to trauma and its reminders
  - E: Symptoms of increased arousal
    - F: Duration > one month
    - G: Significant distress or impairment of functioning
PTSD: Behavioral Diagnostic Markers

- The DSM-IV (2013 revision) manual further specifies the symptoms of increased arousal – patients must demonstrate 2 of the following:
  - Sleep Disorder (difficulty going to sleep and/or staying asleep)
  - Irritability or outbursts of anger
  - Difficulty concentrating
  - Hypervigilance (anxiety, stress)
  - Exaggerated startle response (sound tolerance problems)

PTSD: Behavioral Diagnostic Markers

- Increased arousal and audition
  - Consider the similarities between intake forms for both tinnitus and PTSD
    - Anger, sleep, concentration, depression, etc. are considered on intakes for both
    - Exaggerated startle response as a form of sound tolerance problem
    - Hypervigilance contributes to annoyance, distress, difficulty sleeping

PTSD in Primary Care

- PTSD Primary Care Questionnaire (Prins et al, 1999); patients screened with following questions:
  - In your life, have you had any experiences that were so frightening, horrible, or upsetting that, in the past month, you…?
  - 1. Have had nightmares about it or thought about it when you did not want to?
  - 2. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it?
  - 3. Were constantly on guard, watchful, or easily startled?
  - 4. Felt numb or detached from others, activities, or your surroundings?
  - Positive responses on 3 items “strongly” suggest need for complete evaluation – the responses

PTSD: Diagnostic Tests

- Mississippi Scale for Combat-Related PTSD (Keane et al., 1988); standardized on 2200 vets
  - 35-item questionnaire (also a 39-item version, but the Quillen VAMC section uses the former)
  - 1-5 points for responses
  - 107-point cut-off is recommended for Dx

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Frequently</th>
<th>Very Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>12. I wonder why I am still alive when others died in the military.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>28. I feel there are certain things that I did in the military that I</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5.  The people who know me best are afraid of me.</td>
<td></td>
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</tr>
</tbody>
</table>

Note: “positive worded” item scores are reversed

PTSD: Diagnostic Tests

- Mississippi Scale for Combat-Related PTSD
  - Additional items reflecting degree of distress
    - 8. When I think of things I did in the military I wish I were dead
    - 26. Nobody understands how I feel, not even my family.
    - 20. I have trouble concentrating on tasks.
    - 24. I fall asleep easily at night.
    - 25. Unexpected noises make me jump.

Note: “positive worded” item scores are reversed
PTSD: Diagnostic Tests – the PTSD Checklist: Civilian version (PCL-C)

• Avoid activities or situations because they remind you of a stressful experience from the past?
• Trouble remembering important parts of a stressful experience from the past?
• Feeling emotionally numb or being unable to have loving feelings for those close to you?
• Feeling as if your future will somehow be cut short?
• Repeated, disturbing memories, thoughts, or images of a stressful experience from the past?
• Repeated, disturbing dreams of a stressful experience from the past?

Trauma that Produces PTSD

• Most people who experience a traumatic event will not develop PTSD. However, individuals are more likely to develop PTSD if they:
  • Experienced trauma during childhood
  • Were directly exposed to the traumatic event as a victim or a witness
  • Were seriously injured during the event
  • Traumatic event was long-lasting or very severe
  • Had a severe reaction during the event, such as crying, shaking, vomiting, or feeling apart from surroundings (i.e., patient reports seeming to hover over body, watching the event transpire)
  • Felt helpless during the trauma and were not able to help oneself or a loved one.

PTSD Mechanisms: Cortisol

• Cortisol levels
  – Produced in adrenal glands
  – Prolonged stress results in chronically high levels of cortisol
  – Decreases immune system function (as short-term survival is the priority during cortisol release)
  • Contributed to chronic hyperarousal through long-lasting noradrenergic release
  – Increases blood sugar level and blood pressure
  – Acts as an anti-inflammatory

PTSD: Neural Mechanisms

• Animal models of fear conditioning and acute stress supported subsequent human brain imaging results
• Three major brain structures are implicated in the animal models:
  • The amygdala, activated by fear and stress
  • The hippocampus, which is important for memory and conditioning but which is impaired and even damaged by excessive arousal states and….
  • The prefrontal cortex (PFC), which should, under normal conditions exert inhibitory control over the amygdala

PTSD Mechanisms: Cortisol Physiologic Effects

• Primary control over cortisol levels is mediated by pituitary gland and the hypothalamus
  – Cortisol stimulates adrenal glands
  – The stress-provoked hyperactivity of the Hypothalamus-Pituitary-Adrenal (HPA) axis activity is well-documented in trauma victims (Schnurr & Janikowski, 1999)
• Produces transient infertility during periods of elevated stress
• Reduces serotonin levels in the brain
• Sleep deprivation increases cortisol levels
  – Caffeine also increases levels

Bremner, 2005; Brain Imaging Handbook
PTSD Mechanisms: Cortisol and Memory

- In concert with adrenaline, cortisol contributes to memory storage of brief emotional events (so-called flash-bulb memories)
  - Perhaps cementing in memory things to be avoided in the future, or environments associated with trauma and survival threat
- Chronic, long-term elevated levels damage cells in the hippocampus
  - Decreased volume has been recorded in hippocampus of soldiers returning from combat deployments
  - Learning impairments (specifically with regard to coping strategies)
  - Contributes to deficiencies in memory retrieval as well

Experience and Neural Plasticity

- William James (1890): “An impression may be so exciting emotionally as almost to leave a scar upon the cerebral tissues.”
- Judith Herman (1997): “Repeated trauma in adult life erodes the structure of the personality already formed, but repeated trauma in childhood forms and deforms the personality. For hundreds of years, observers have described these phenomena with both fascination and horror.”
- Aage Møller (2010): “Activation of neural plasticity can be purposeful and beneficial, or it can be purposeful, but not beneficial”

PTSD – Emotional (Flashbulb) Memories; The Temporal Dynamics Model of Emotional Memory Processing (Diamond et al., 2007)

- Effects of traumatic stress
  - Diamond et al suggest that traumatic exposures generate a “strong emotional learning experience” with associated activation of short-term plasticity and ultimately long-term potentiation in the amygdala and hippocampus
  - Following this brief period of activation, both structures undergo a “state in which the induction of new plasticity is suppressed”
  - The result is the consolidation of a traumatic memory; the so-called long-lasting flashbulb memory
  - Patients may report tinnitus that is associated with such memories, perhaps enhancing its effect on performance of complex tasks or attention over time

Experience and Neural Plasticity

Traumatic events that produce auditory insult raise the probability that individuals will develop tinnitus, but does the process by which traumatic/emotional memories are formed increase the likelihood that a victim develops and maintains distressing and handicapping tinnitus that persists beyond the temporal boundaries of the traumatic event?
Within minutes of the exposure’s onset, NMDA receptor sensitivity saturates, decreases, and ongoing stimulation reduces hippocampal LTP despite continued activation of the amygdala. Therefore, the amygdala’s contribution to memory formation increases relative to that of the hippocampus for a brief period of time.

Amygdala eventually displays inhibitory phase, allowing for further consolidation of traumatic/emotional memory. Memory may include events co-occurring with the trauma (i.e., the “warning signal” as described by Ehlers et al.). Suggest we consider the possibility that tinnitus may be (an element of) this warning signal.

Pre-frontal cortex is exclusively inhibited by stress (unlike hippocampus and amygdala). “Recovery from its suppression of functioning would depend on the nature and intensity of the stressor, interacting with the ability of the individual to cope with the experience.” - Diamond et al. Add’l elements of the model supported by Bremner and others who have shown that in cases of severe trauma, the PFC may not recover its ability to suppress the activity of lower brain areas, such as the amygdala.

Johnathan Shay: Achilles in Vietnam

• Shay (1994): “When the body is tortured or its boundaries are violated, or it is otherwise assaulted by starvation, sleep deprivation, cold, or drugs under which escape is impossible, the body reacts with fear and rage, and the mind undergoes a distinctive kind of deep learning. After the danger and violation have passed, the deep learning persists as PTSD symptoms and damage to the best (and most highly valued) character as understood within the culture.” p. 208
Trauma and Health

- Consider prolonged effects of trauma as producing psychological injury with associated profound behavioral changes (Shay, 1994; 2001)
- PTSD (recall the effects of cortisol) is related to higher levels of health-related problems (Schnurr & Green, 2004) and to lower levels of functioning (Thorpe & Stein, 2005) in veterans and civilians
- PTSD exacerbates:
  - Chronic mental health conditions (depression, anxiety, nervousness, aggressiveness)
  - Chronic physical conditions (GI, cardiopulmonary, circulatory, chronic pain (particularly back pain))
  - Substance abuse
  - Tinnitus distress

PTSD – Military Effects of Trauma
(www.ptsd.va.org)

- In veteran groups:
  - About 30%, or nearly one million VN era veterans
  - In as many as 10% of first Gulf War veterans
  - In at least 10% to 15% of veterans of the war in Afghanistan
  - In at least 12% to 20% of veterans of the second Iraq war
- Consider: These will be our patients for the next 40 + years

Why Consider Traumatic Associations with Tinnitus?

- What we learn from patients with tinnitus and psychological disorder
  - Greater tinnitus handicap as indicated on questionnaire responses
  - Patients have lower levels of confidence in ability to manage condition, poorer coping ability and lower self-efficacy, than patients whose tinnitus is not complicated by psychological injury
  - Patients frequently misinterpret or misjudge physical characteristics of environmental events
    - Hyperacusis may be a blatant form of the effect
    - Exaggerated startle responses
      - All of this can occur, and affect tinnitus, regardless of hearing loss

Profile of Patients with Tinnitus and Co-Morbid Psychological Injury/Disorder

- Clinical findings support mutual reinforcement:
  - McKenna (2004), Coles (1995), Baguley (2011), not to mention centuries-old medical literature
  - Of our first 800 patients, 276 (or 35%) are enrolled concurrently in one or more PTSD clinics (many have PTSD in addition to other psych-specific service connections)
  - An additional 254 patients seen in mental health clinics for anxiety/depression/panic disorders w/out PTSD
  - Symptoms that indicated need for psych referral relate to onset of tinnitus, reactive tinnitus, presence of hyperacusis, and exacerbating conditions (also nightmares, hypervigilance, exaggerated startle response)
**Perceived Tinnitus Handicap, and Relation to Auditory Sensitivity**

- Tinnitus
- Tinnitus & PTSD
- Tinnitus Mean
- Tinn & PTSD Mean

**Tinnitus and Non-auditory Triggers (Coles, 1995)**

- Figure 3: Factors which trigger the onset of tinnitus. (URT=upper respiratory tract infection).

**Profile of Patients with Tinnitus and Co-Morbid Psychological Injury/Disorder**

- Clinical findings – Tinnitus-related symptoms that distinguish stressed patients:
  - Onset of tinnitus (2x more likely to experience sudden onset)
  - Reactive tinnitus (3x more likely to experience tinnitus that is exacerbated by exposure to other sounds)
  - Presence and severity of hyperacusis
  - Other exacerbating events, such as nightmares, hypervigilance, exaggerated startle response

**Reported Onset of Tinnitus (N=500; T=329; PT=171)**

- Fagelson, (2007). The Association between tinnitus and PTSD; AJA.

**Prevalence of ‘reactive’ tinnitus**

<table>
<thead>
<tr>
<th>Does tinnitus get louder in response to other sounds?</th>
<th>Proportion of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild tinnitus (N=167)</td>
<td>18%</td>
</tr>
<tr>
<td>Moderate tinnitus (N=198)</td>
<td>31%</td>
</tr>
<tr>
<td>Severe tinnitus (N=155)</td>
<td>68%</td>
</tr>
<tr>
<td>Pts. with psych. condition (N=206)</td>
<td>62%</td>
</tr>
<tr>
<td>Pts. with PTSD (N=173)</td>
<td>91%</td>
</tr>
</tbody>
</table>

- Fagelson, (2007). The Association between tinnitus and PTSD; AJA.
Patient Ratings of Tinnitus/Hearing Symptoms

Sound Tolerance Problems

What's Worse? Tolerating Moderately-Loud, Routinely-Experienced Sounds, or Your Tinnitus?

Sounds Triggering Physical Discomfort

Tinnitus Provoking Heightened Fear Response in Trauma Victims

Targeting the Response to Tinnitus

- Sensory events trigger powerful physical responses
- The sensory events (including tinnitus) can be misinterpreted by the perceiver, ultimately processed as if threatening even if innocuous
- May create arousal consistent with survival instincts or with the sense of threat (deafness, tumor, insanity, etc.)
- May produce tinnitus that demands attention in a manner consistent with the weapon used in an assault
  - The attention it demands ensures it will interfere with routine tasks, concentration, sleep, etc.
Tinnitus (and PTSD): Counseling & Educating the Patient

- Cognitive behavioral therapy (CBT)
  - Teaches patient ways of thinking and reacting to the events that trigger trauma-related symptoms
  - Goal is to bring the powerful symptoms under control
  - Use of rational thinking, or conscious knowledge of events and tinnitus to improve sense of control
  - Patients with PTSD challenged by chronic-stress-related changes to cortical and limbic system structures that should only be activated during stressful or threatening events

Counseling & Educating the Patient

- CBT is the most widely reported (and successful) veteran PTSD treatment
  - Effective in 60-80% of reported cases
  - Also Recommended by Sweetow (1986), Henry & Wilson (2001), Cima et al. (2011) for managing severe tinnitus (several elements also used in TRT)
  - Patient reframes experience by internalizing different definitions/lexicon of the tinnitus/trauma (cognitive restructuring)
  - Modifies behavior so that the factors associated with stress/tinnitus exacerbation are managed more effectively

Cognitive-Behavioral Therapy

- Example: Patient who withdraws from activities due to belief that tinnitus ruins all social interactions by impairing communication, resulting in the patient feeling inadequate
  - Patient may also have aversion to crowds due to sense of insecurity, or feeling unsafe
  - If communication is the problem, strategies, hearing aids, rehab may be employed
  - If negative beliefs re: perceptions or intentions of strangers is the problem, such thoughts can be examined with family members and support group
  - Education re: tinnitus and hearing loss may confirm for pt. that the problems experienced are to be expected in the presence of background noise
  - Intentions of others may remain a problem, but patient can benefit from improved ‘internal dialogue’ and rational approaches to social situations

Adapted from Hinton et al., 2006 (J. of Traumatic Stress)
Cognitive-Behavioral Therapy

• Components that may be included in CBT course:
  – Group sessions: coping strategies, others’ narratives
  – Interprofessional team approach
    • Include ENT, clinical psychology, physical therapy, social work, nutrition, neurology, other?
  – Mindfulness training
    • Teaching patient to focus attention in purposeful and willful manner
    • Practice different forms of imaging, relaxation exercises, meditation, yoga; all intended to sharpen the patient’s ability to shift attention
    • May also produce durable changes in neural activity associated with stress and relaxation
    • Shown to improve management of chronic pain, stress, and other hyperactive neural activity similar to tinnitus

Self-Efficacy Theory

• Belief, or domain-specific confidence, individuals have in their abilities (or a specific skills) to accomplish, develop, and/or maintain a certain behavior, including health behaviors (Bandura, 1986, 1997)
  – Self-efficacy can be high in one domain, low in another
• Different from a general self-confidence or self-esteem
• Investigated as a way to improve patients’ sense of control

Why Is Self-Efficacy Important?

• Patients with high self-efficacy beliefs for skills needed to manage a health condition have been associated with:
  – Increased compliance with treatment/management recommendations
  – Improved subjective and objective outcomes
  – Higher health-related quality of life
  – Persevere in face of difficulty
  – Put forth greater effort in managing condition

Motivation for the Self-Efficacy for Tinnitus Management Questionnaire (SETMQ)

• In the context of existing questionnaires
  – Many functional and emotional items consistent across different intake forms, self-assessments of handicap
  – Sleep, communication/hearing, emotional response to tinnitus, concentration ability (i.e., Tyler, 2006)
• Common patient complaints
  – Lack control over the sensation (on THI, more than 85% of our patients endorse that specific item)
  – Lack understanding of its source and relation to hearing loss
  – Self-image affected, ability to function questioned; some patients question the accuracy of their senses

Counseling Considerations: Self-efficacy

• Use of Self-efficacy scaling
  – “The confidence individuals have in their capabilities to perform courses of action needed to manage their tinnitus successfully.” (Smith & Fagelson, 2011)
  – Questions pt. regarding specific activities that challenge coping with and management of tinnitus
  – Although self-efficacy may be high in one area (i.e., the pt. believed his tinnitus did not influence his ability to concentrate or communicate on one on with someone), it may be low in another (i.e., tinnitus affected quality of sleep and ability to converse with groups of people).
  – Targeting the activities for which the pt. is less certain of success fosters specific management strategy discussion

Sample SETMQ Items (Smith & Fagelson, 2008)

1. I can control my anger when I hear my tinnitus. How certain are you that you can do this right now? (circle one %)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Cannot do Moderately certain I am certain this at all I can do this I can do this

6. I can control feelings of being afraid when I hear my tinnitus. How certain are you that you can do this right now? (circle one %)
   0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
   Cannot do Moderately certain I am certain this at all I can do this I can do this
Self-Efficacy for Tinnitus Management Questionnaire Results

Use of Aids and Sound Generators
- Sound generator for bedside use (new smartphone apps may reduce need to order specific device)
  - Recommend running device throughout night
  - Set at comfortable level (total masking not the objective)
  - Open fit
  - Program for communication situations (set to typical target gain values for preferred prescriptive methods)
  - Program for tinnitus specified for use in quiet situations when tinnitus would be most noticeable

Hearing aid selection with use of ‘tinnitus program:’ Searchfield (2005)

<table>
<thead>
<tr>
<th>Hearing Aid Feature</th>
<th>Standard Program</th>
<th>Tinnitus Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microphone</td>
<td>Directional</td>
<td>Omnidirectional</td>
</tr>
<tr>
<td>Prescriptive Formula</td>
<td>NAL-NL1 or other preference</td>
<td>DSL(o)</td>
</tr>
<tr>
<td>Noise Reduction</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Compression</td>
<td>Low compression ratio if possible, prioritize naturalness and audibility</td>
<td>Low kneepoint, high compression ratio, prioritize use of LF env. sounds</td>
</tr>
<tr>
<td>Output</td>
<td>Must take care in all fittings, for all programs, to ensure patient loudness tolerances are addressed.</td>
<td></td>
</tr>
</tbody>
</table>

PTSD– Considerations for Auds
- Hearing aids
  - Facilitate monitoring environment
  - Make some social situations easier to manage
    - Communication in aversive settings might improve
  - Pt. less often surprised by sudden unexpected sounds
  - Establishing acceptable output levels the most important consideration
Hearing Aids Ameliorate Tinnitus Distress?

<table>
<thead>
<tr>
<th>Do hearing aids reduce the amount of tinnitus distress?</th>
<th>Proportion of “Yes” Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild tinnitus (N=83)</td>
<td>58%</td>
</tr>
<tr>
<td>Moderate tinnitus (N=162)</td>
<td>53%</td>
</tr>
<tr>
<td>Severe tinnitus (N=89)</td>
<td>59%</td>
</tr>
<tr>
<td>Pts. with psych. condition (N=134)</td>
<td>32%</td>
</tr>
<tr>
<td>Pts. with PTSD (N=118)</td>
<td>55%</td>
</tr>
</tbody>
</table>

Patients Suffering from Stress: Additional Considerations

- Arousal symptoms most relevant for AUDs
  - They indicate excessive physiological activation
  - Exaggerated Startle
  - Loudness tolerance issues
- Patients (understandably) dislike confined spaces and unexpected sounds (test suite? PT and AR testing? LDLs?)
  - If you know that your tinnitus gets worse following exposure to loud sounds, make sure the audiologist knows before testing starts

Patient Background

- 53 yr. old male: Audiologic case info (2001):
  - Communication difficulties; particularly in challenging listening conditions
  - Longstanding (since 1968) tinnitus
  - Pain in his ears and facial muscle weakness that seems to be getting worse over time
- Results:
  - If you know that your tinnitus gets worse following exposure to loud sounds, make sure the audiologist knows before testing starts

Case Study: Trauma Victim

- Military trauma, however it is clearly not the typical case, and relates to events that might also affect a civilian
- Tinnitus Case History (53 yr. old male; initial contact 2001):
  - Tinnitus sound: High-pitched tone
  - Sudden onset following noise trauma on the firing range (1968)
  - Reached current level at onset
  - Reactive tinnitus exacerbated by unexpected impulse sounds
  - Sound tolerance problems, both when aided and unaided, complains aids have “never worked right”

Case Studies: Trauma Victim

- Additional Medical History
  - Dxed with PTSD in the 1990s (charted info supports presence of chronic stress, anger, pain, sleep disturbance, depression, anxiety)
  - VIIth nerve surgery on right side years before due to “weakness and pain” (eventually bilateral)
  - Psych intervention recently initiated; including meds for sleep and pain
  - “Never been out of Greene county” except for time overseas in the service
Management Plan: Initial contact

- Sound generator to facilitate sleep
  - Different devices and sounds demonstrated for the pt.
  - Pt. counseled on use of device
    - Do not set at uncomfortable level (‘arms race’ between device and tinnitus if total masking sought)
    - Do not use timer
  - Confirm pt. is continuing psych. care
- Do not set at uncomfortable level (‘arms race’ between device and tinnitus if total masking sought)
- Do not use timer

Case Study

- Brief chronology:
  - 9/24/01 – initial contact, case hx, tinnitus tests, sound generator discussed and ordered
  - 10/26/01 – pt. reports sound generator very helpful for sleep; counseling re: mechanisms and reactions
  - 12/27/01 – sleep continues to improve, understanding of the tinnitus mechanism also helpful (reduces stress); THI repeated
  - 2/25/02 – hearing worse following 2nd VIIth N. surgery; tinnitus less bothersome than first contact, but worse since surgery
  - 3/21/02 – counseled re: hearing aids with maskers; impression taken, aids ordered
  - 5/13/02 – hearing aids and maskers fitted, helpful immediately
  - 7/25/02 – Substantial improvement noted w/ hearing aids; tinnitus testing repeated

Dates during which tinnitus measurements were made

<table>
<thead>
<tr>
<th></th>
<th>9/24/01</th>
<th>12/27/01</th>
<th>7/25/02</th>
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<tbody>
<tr>
<td>T match</td>
<td>8kHz @ 62 &amp; 67 dB HL (AD &amp; AS)</td>
<td>8kHz @ 60 &amp; 62 dB HL (AD &amp; AS)</td>
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<tr>
<td>WN MML</td>
<td>50 dB AD 52 dB AS</td>
<td>50 dB AD 50 dB AS</td>
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<tr>
<td>THI</td>
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Summary

- Priorities of intervention illustrated by this patient
  - Intent was to improve pt’s response to tinnitus (NOT a treatment)
  - Identify strategies that address specific functional impairments experienced by patient (ie., sleep, communication)
  - Hearing aids a far more effective intervention (due to their flexibility) than in the past, with or without combination masking circuitry
  - Work w/ psychologists, or other professionals to ensure that co-morbidities are being addressed
  - Support pt’s ability to distinguish tinnitus effects from the effects of other conditions or injuries that exacerbate it

Considerations for Audiologists

- Arousal symptoms to watch for:
  - Irritability (by own report): Indicates excessive physiological activation (sound-provoked tinnitus exacerbation)
  - Exaggerated Startle: A heightened sense of “being on guard”
  - May want door to booth open, certain lighting, unknown people (ie., supervisees) out
  - Priority must be to create an environment in which the patient feels safe, and can share impressions freely

Summary

- High prevalence of PTSD among civilian and veteran populations has implications for audiologists, their tests, and interpretation of pt. history and complaints (prior trauma a major factor)
- Hyperarousal causes mislabeling of sensory information, central to PTSD and hyperacusis
- Intrusive memories may be triggered by such sensory inputs particularly those associated w/ trauma (unexpected impulse sounds, etc.)
Summary

• Herman (1997): “Repeated trauma in adult life erodes the structure of the personality already formed, but repeated trauma in childhood forms and deforms the personality. For hundreds of years, observers have described these phenomena with both fascination and horror.” p. 98

PTSD Changes People and Character

• Shay (1994):
  – Violation of “what is right” or social/moral order (whether in families or the military) has potential to “inflict manifold injuries” on the victim
  – Example: Soldier sent to look for “squelch” during artillery exercise with resulting psychological damage (loss of trust in superiors and peers), hearing loss, and physical trauma.
  – As in a family abuse situation, violation of a moral order affects the most vulnerable most profoundly

PTSD Changes People and Character – we are now realizing that our policies must change to address their needs

• Throughout the Vietnam era, some veterans were discharged under less-than-honorable conditions due to behavior or incidents that may have been related to what has now been diagnosed as Post Traumatic Stress Disorder (PTSD). On Wednesday, Sept. 3, 2014, the Department of Defense announced specific guidance to help ease the application process for veterans and their families who are seeking redress. This may provide many veterans greater success in appealing and upgrading their character of discharge, which could open the door to eligibility for benefits that may have been previously denied. - See more (encourage pts to check at):
  http://wwwvvmf.org/news/article=DoD%20willing%20to%20reconsider%20discharges%20of%20Vietnam%20vets%20with%20PTSD#sthash.stLwlN3x.dpuf

3 great references:
1. Jonathan Shay – Achilles in Vietnam (Scribner)
2. Judith Herman – Trauma and Recovery (Basic Books)
3. Jonathan Shay – Odysseus in America (Scribner)