

# Tinnitus News, Review, and Update: 2024

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This article reviews the contemporary literature and significant developments regarding the management (diagnosis and treatment) of tinnitus.

As of November 2023, there are some 336 million people in the United States ([www.census.gov/popclock/](http://www.census.gov/popclock/)). Using the population percentage breakdown from Davis and El Rafaie (2000)<sup>1</sup>, one might expect that approximately 15% of the U.S. population experiences tinnitus. Stocking and Stecker (2016)<sup>2</sup> observed there is a difference between people with tinnitus (approximately 50 million in the USA) and actual tinnitus patients (perhaps 2-5 million in the USA). For tinnitus patients, the emotional component of their tinnitus is paramount. There are two essential factors in tinnitus; the sound perceived and the reaction to it. Generally, people with tinnitus dismiss, ignore, or minimize it such that it does not impact their quality of life. However, as Serences (2023)<sup>3</sup> reported, what we experience is not merely a product of objective sensory input, rather, our experience is a consequence of sensory input/factors and the internal state of the observer.

Moller (2011)<sup>4</sup> reported tinnitus is not one thing, it is many things—and it may be different in each person who experiences it. Among tinnitus patients, there is a significant range of unique experiences and often a degradation of quality of life. Tinnitus may exacerbate or cause insomnia, cause difficulty hearing, impair concentration, create stress, anxiety, and depression, and may cause problems at work and home<sup>5</sup> and may impact socialization ability. Rates of depression in people suffering with tinnitus vary from 33-60%.<sup>6-8</sup> The perception of, and structural changes associated with tinnitus are correlated with an increased risk of dementia including early-onset dementia.<sup>9-11</sup> Figure 1 illustrates changes in brain activity recorded from people with tinnitus.

Nearly 14% of tinnitus patients categorize their tinnitus as catastrophic, indicating their tinnitus is unrelenting or has a severe and significant negative impact on their life. Nonetheless,



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and of utmost importance, Sweetow & Sabes (2010)<sup>12</sup> stated it is unethical and immoral to tell a tinnitus patient “There is nothing that can be done for you.” We (DLB and KND) emphatically and whole-heartedly agree. It is likely that some 90% of tinnitus patients can learn to effectively manage their tinnitus through professional hearing care and technology.<sup>13</sup>

## TYPES OF TINNITUS

There are two tinnitus types:

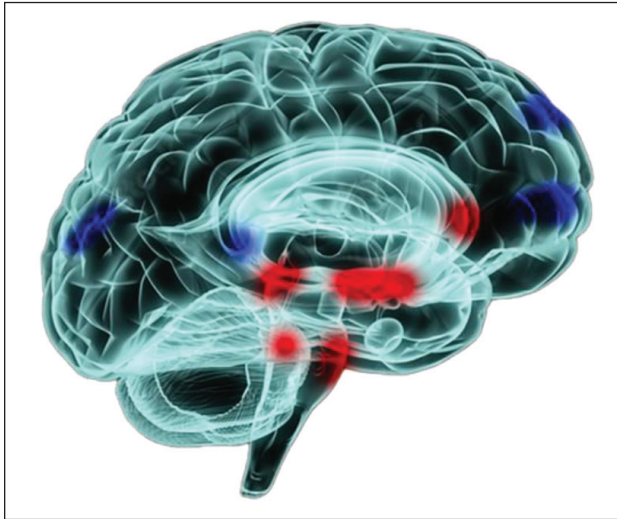
*Subjective tinnitus* is the most common type of tinnitus. It is the perception of sound without a known or identifiable physical sound source. That is, when a patient perceives a “phantom” sound in the absence of a physical sound source, that person is experiencing tinnitus. Although exact numbers are unknown, it appears that some 95-98% of all tinnitus is subjective.<sup>14</sup>

*Objective tinnitus* is the perception of sound with a known physical sound source. Objective tinnitus may result from a perforated tympanic membrane, ear infections such as otitis media (and variants), eustachian tube dysfunction, craniofacial anomalies, vascular anomalies (such as glomus tumors or pulsatile tinnitus, which may be associated with the carotid artery or jugular vein or other vasculature), foreign bodies within the ear canal or in contact with the tympanic membrane (such as cerumen, insects, and more). Objective tinnitus might be due to a cerebellar-pontine angle (CPA) tumor or an intracanalicular tumor (for example vestibular schwannoma, aka acoustic neuroma) impinging upon the cochlear branch of the eighth cranial nerve presumably causing the nerve to discharge, resulting in tinnitus.



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professional topics, including op-eds, audiology, language, pediatrics, cognition, hearing aids, amplification, psychology, neuroscience, anatomy and physiology, counseling, and more. Dr. Beck has delivered more than 1,000 lectures, keynote addresses, webinars, and other professional presentations. He continues to consult for multiple clinical, scientific, and other organizations. **Dr. Keith N. Darrow** is a tenured professor at Worcester State University, the founder of Hearing & Brain Centers of America, and the founder of Excellence in Audiology.



**Figure 1.** Illustration of fMRI scans from patients living with tinnitus. Areas of the brain with abnormal increases in neural activity (red), i.e., ‘central gain,’ include the brainstem, thalamus, limbic area (emotion), and hippocampal regions (memory). Areas of the brain with noted decreases in neural activity (blue) include the frontal cortex (decision-making, memory, speech planning, etc.) and precuneus area (recollection and memory). Adapted from Chen, et al. 2014.

## TINNITUS VARIANTS

Tinnitus can be transient or chronic and may be perceived and described by the patient as sounding like a tone, multi-tonal, buzzing, ringing, crickets, whistling, humming, roaring, chirping, static, rushing sounds, high pitch, low pitch, electric wire noise, and more. Tinnitus may be localized as central (perceived within the head) or peripheral (localized to one or both ears). Central and bilateral tinnitus are far more common than unilateral tinnitus. All cases of unilateral tinnitus should be referred to a physician, preferably an ENT for medical evaluation and management.

Auditory hallucinations may sometimes be considered tinnitus. If, for example, the patient reports they “hear” ongoing music, or bells, or tunes, and if it can be determined that these are not “ear worms” these may be manifestations of tinnitus. *Ear worms* can be defined as the unintentional memory or recall of a musical event. Most people have experienced ear worms as a song that they cannot get out of their head. Generally, this sensation is temporary and is a benign psychological experience. However, when a patient reports they hear “voices” and, when they communicate with those voices, that may be a sign of psychosis and should be immediately referred to their primary care (or treating) physician.

## SUBJECTIVE TINNITUS ETIOLOGY

It is rare to know the specific etiology of tinnitus in most cases. The most common risk factors for tinnitus are age<sup>15</sup> and hearing loss.<sup>16</sup> Although tinnitus often occurs in tandem with presbycusis, noise induced hearing loss, sudden sensorineural hearing loss (SSNHL), etc., it is not a one-to-one correlation. Beck (2012)<sup>16</sup> proposed the 80/80 rule, which states that

roughly 80% of people with tinnitus have SNHL, and 80% of the people with SNHL have tinnitus. It seems likely that in these cases, hearing loss and tinnitus share the same etiology, such as the reduction of neural output from the cochlea to the brainstem through natural cochlear synaptopathy (permanent loss of neurons), which occurs across the mammalian lifespan.

Thus, down-regulation of neural input to the auditory brainstem is potentially the instigator of increased output in higher auditory brainstem centers, such as the inferior colliculus. Although, this central gain in activity may also be due to the “release of inhibition” from descending corticothalamic regulation.<sup>17</sup> Additional risk factors for developing tinnitus include exposure to chemicals, as well as the presence of migraine,<sup>18,19</sup> smoking, stress, anxiety, depression, and more. Not coincidentally, each of these risk factors is also associated with hearing loss. Resultantly, in most cases, the experience of tinnitus is an inexact and idiopathic exacerbation of individual and underlying potential etiologies, manifested potentially due to a new or cumulative insult.

Self-reported chronic tinnitus has been significantly associated with a reduction in cochlear nerve responses, lower amplitude middle ear reflexes, increased medial olivocochlear efferent reflexes and general hyperactivity in the central auditory pathways. These findings support that decreased neural activity from a damaged cochlea may elicit hyperactivity based on decreased inhibition within the central nervous system.<sup>20</sup>

Jasterboff (1990)<sup>21</sup> addressed the non-auditory cortical and sub-cortical systems often impacted by tinnitus, which may explain the range of patient experiences from ‘barely noticing it’ to suicidal thoughts and actions.<sup>22</sup> Jasterboff’s model de-emphasizes peripheral and central hearing loss while focusing on known cortical innervations of the auditory system and shifted attention on the limbic system; which often controls emotional and behavioral responses. Jasterboff’s model points to pre-existing mental health disorders in patients who suffer with unrelenting and/or incapacitating tinnitus<sup>6</sup> and HCPs are encouraged to consider the mental health and psychological well-being of their tinnitus patients and refer appropriately.

Biagi, Oden, Almlid-Larsen, et al. (2011)<sup>23</sup> surveyed more than 20,000 people regarding multiple factors related to tinnitus. Of those, a response was obtained from 12,166 subjects (61% response rate). Biagi, et al. reported *stress* was the primary factor which determined whether tinnitus was perceived as mild or significant. They reported stress management strategies should be considered for appropriate tinnitus candidates.

Pinto, et al. (2014)<sup>24</sup> reported psychiatric disorders such as anxiety and depression are often present in tinnitus patients. The authors report the presence of psychiatric disorders correlates with tinnitus-related annoyance and severity. Fagelson (2014)<sup>25</sup> reported half of all patients with tinnitus are likely to have co-morbid psychological injury (such as PTSD) or psychological illness (depression, anxiety, OCD). Pupić-Bakrač and Pupić-Bakrač (2020)<sup>26</sup> report that although contemporary literature indisputably proves connections between tinnitus and psychological stress, it is unknown whether stress is the etiology or a contributing factor.

Hebert (2021)<sup>27</sup> reported most patients will cope with tinnitus and rarely need more than information and reassurance from professionals. Some patients will need more supportive management. The authors state assessment of psychological comorbidities is very important as the most frequent complaints from tinnitus patients includes stress, depression, and anxiety. Herbert too, asks whether tinnitus causes comorbidities, or is tinnitus the result of the same?

### DIAGNOSIS FIRST, TREATMENT SECOND

It is of maximal importance to diagnose the type of tinnitus (subjective or objective tinnitus) and the corresponding risk, as well as the need for a physician referral. It is our belief that all objective tinnitus patients and all patients experiencing unilateral tinnitus should be referred for a medical tinnitus evaluation and management (preferably by an otolaryngologist) in tandem with audiologic management. Subjective tinnitus is most often treated by doctors of audiology. In some states, trained and licensed hearing aid dispensers are permitted to manage tinnitus patients. Each state has its own rules and regulations and each professional must verify their state licensure rules, regulations and requirements.

To determine if subjective tinnitus is attributed exclusively to the auditory system, the hearing care provider should follow a comprehensive diagnostic protocol to rule out the contributions of each portion of the bone- and air-conduction pathways of sound. Protocols should minimally include:

**Otoscopy:** Tinnitus is commonly associated with impacted cerumen or other lesions/masses in the outer ear or external ear canal.

**Tympanometry:** Damage to the tympanic membrane, otitis media, otosclerosis, eustachian tube dysfunction, ossicular chain discontinuity are all known risk factors for tinnitus.

**Standard Audiogram (250Hz – 8000Hz):** A benefit of the audiogram is to differentiate conductive from sensorineural hearing loss. Unfortunately, animal studies have shown that the audiogram is not a valid metric for determining the extent of damage within the cochlea. Specifically, damage to the outer and/or inner hair cells must be used cautiously to diagnose pathology as the loss of neural connections within the ear (i.e., synaptopathy) can reach 80% without significantly impacting audiometric thresholds.<sup>28-31</sup>

**Extended High Frequency (EHF) Audiometry:** Deficits and asymmetries in extended high frequency hearing are associated with the presence of tinnitus despite 'normal' audiometric hearing.<sup>32</sup> EHF hearing loss can often foretell the decline in hearing 10-20 years in advance.<sup>33</sup> Indeed, the magnitude of the EHF hearing loss has been tightly linked to tinnitus.<sup>34</sup>

**Word Recognition Scores (WRSs):** Traditional WRSs are not a rigorous metric of hearing and/or listening capabilities. Indeed, 60% or more neural damage must be present before its contribution is witnessed via traditional WRSs in quiet.<sup>28</sup>

**Speech-in-Noise (SIN) Assessment:** SIN assessment is tremendously important and highly sensitive and is advocated by AAA, ASHA and IHS as best practice in audiometric evaluations. Often, anomalies on SIN tests will be apparent years or decades before hearing loss is obvious via pure-tone thresholds. Additionally, there is significant evidence that attenuated

SIN scores may predict an increased risk of cognitive problems over the next decade (or so) in at-risk patients.<sup>35</sup>

**Cognitive Screening:** As many contemporary publications correlate hearing loss with cognitive decline in at-risk patients<sup>9-11,35,36</sup> and in accordance with AAA and ASHA Scope of Practice statements, many HCPs have incorporated cognitive screenings within their test battery for patients at higher risk for cognitive decline such as older patients, patients with moderate-severe (or worse) hearing loss and people with other comorbid factors. Tinnitus may significantly impact both the form and function (i.e., anatomy and physiology) of the brain, while potentially increasing the risk of early-onset and other dementias.<sup>9-11,37,38</sup>

### MEASURING THE IMPACT OF TINNITUS

Few hearing health care professionals (HCPs) use tinnitus questionnaires, scales, and tinnitus simulators to measure the perception, annoyance, and impact of tinnitus, or the effectiveness of treatment. We advocate measuring tinnitus loudness and pitch (or similar characteristics for non-tonal tinnitus) as well as residual inhibition on appropriate patients. We believe tinnitus scales and questionnaires are extraordinarily useful and should be incorporated into each tinnitus evaluation to:

1. Quantify your patient's experience with tinnitus.
2. Quantify the impact of tinnitus on social, emotional, hearing, sleep concentration, etc. aspects of life.
3. Track the effectiveness of treatment.

Among the most common tinnitus questionnaires are the following:

**Tinnitus Handicap Index.**<sup>39</sup> The THI is the most common tinnitus questionnaire in hearing health care. The THI has 25 questions which address:

1. The functional impact of tinnitus, such as limitations in the areas of mental, social, and physical functioning.
2. The emotional impact of tinnitus, such as the measurement of affective responses to tinnitus, including anger, frustration, depression, and anxiety.
3. The catastrophic impact which probes the most severe reactions to tinnitus.

The THI has demonstrated pre- and post-test reliability. Of note, a twenty-point change in score indicates a significant difference in tinnitus experience.

**Tinnitus Primary Function Questionnaire.**<sup>40</sup> Tyler and colleagues created this questionnaire to focus on the primary daily domains impaired by tinnitus, including sleep, concentration, hearing and emotion. The intent was to better assess treatment outcomes for each domain. The 20-question form asks five questions for each of the four domains. This questionnaire is considered a valid, reliable, and sensitive means to quantify the impact of tinnitus and to measure the success of treatment.

**Tinnitus Functional Index.**<sup>41</sup> This 25-item questionnaire covers eight aspects of tinnitus handicap and provides a responsive measure of *treatment-related* change. A 13-point reduction is considered a meaningful reduction in TFI scores. The TFI is useful in clinical and research protocols due to the detection of treatment-related change, the scaling of overall

severity of tinnitus, and thorough representation of multiple domains.

**Tinnitus Handicap Questionnaire.**<sup>42</sup> This 27-item tinnitus handicap measurement was developed to measure changes in tinnitus handicap over time. The THQ has three subscales: 1). impact of tinnitus on social, emotional and physical aspects, 2). hearing ability and unease, and 3). the individual's outlook on tinnitus. Total scores are scaled between 0–100, higher scores indicate a greater handicap. A change in score of 21 points has been proposed as clinically meaningful.

### TREATMENT

As noted above, for patients presenting with unilateral or objective tinnitus, a referral to a physician (preferably an otolaryngologist) is recommended. Potential medical, pharmacologic, and/or surgical treatment may be a viable option for patients presenting with objective tinnitus. The patient's safety and health are of paramount importance.

For patients presenting with subjective tinnitus, a “cure” for their tinnitus remains unlikely, while effectively treating their tinnitus is very likely. Effectively reducing the experience of tinnitus and the negative impact it has on an individual's life is the primary goal of treatment. This goal is generally achievable by highly skilled and trained HCPs and is recommended by the American Academy of Otolaryngology – Head and Neck Surgery (AAO-HNS, 2014).

**Cognitive Behavioral Therapy (CBT).** CBT is often referred to as the gold-standard for tinnitus treatment and has been shown to be very successful in managing subjective tinnitus patients. The goal of CBT is to identify and alter maladaptive behaviors associated with subjective tinnitus. The resultant changed behaviors allow sufferers to neutralize their tinnitus perceptions and thereby reduce the impact of their tinnitus. Although CBT is almost exclusively engaged by psychologists and social workers and other trained mental health providers, a few hearing care professionals appear to offer CBT, too. Of note, online CBT therapy has also shown benefit.

As most people with tinnitus have subjective tinnitus, and as the psychological and emotional components of tinnitus are often significant, it may seem like CBT should be the “go to” management protocol. However, it is important to appreciate that most of the people with tinnitus also have hearing loss (see the “80/80 rule” above). That is, if the primary referral route for subjective tinnitus patients is CBT, many patients would likely still have untreated hearing loss. Therefore, although CBT is certainly very effective and remains among the best options for treating unrelenting tinnitus, we advocate audiology-based protocols as the primary therapy, with CBT as the next step, when needed.

**Tinnitus Retraining Therapy (TRT).** TRT represents a distinctive therapeutic approach aimed at mitigating the psychoacoustic and emotional impact of tinnitus. Developed by Jastreboff and Hazell (1993)<sup>21</sup>, TRT is founded on the neurophysiological model of tinnitus, speculating that the condition results from the brain's overamplification of normal auditory signals. Central to TRT is the concept of habituation, wherein individuals are guided to habituate to the tinnitus sound through a process of sound enrichment and cognitive restructuring.

TRT is based on ‘mind over matter’ (or more aptly ‘mind over sound’). Sound therapy, often delivered through wearable sound generator technology, is employed to promote desensitization to the perceived tinnitus noise, while therapeutic counseling techniques assist individuals in altering their emotional and cognitive reactions to the condition. The foundation of TRT lies in the collaborative engagement between the health care provider and the individual with tinnitus, emphasizing education and empowerment. The therapeutic process involves a comprehensive assessment of the patient's tinnitus-related experiences, followed by a personalized treatment plan that integrates sound therapy and cognitive-behavioral strategies. Numerous studies have reported favorable outcomes with TRT, demonstrating improvements in tinnitus-related distress and overall quality of life for those undergoing this structured intervention.<sup>43,44</sup> AAO-HNS Guidelines for Tinnitus<sup>45</sup> combine sound therapy and TRT and state ‘clinicians may recommend sound therapy to patients with persistent, bothersome tinnitus’. The policy statement considers sound therapy and TRT an ‘option’ with a medium level of confidence in the research as the strength of evidence is low. Additional critiques of TRT includes the need for additional psychological intervention (beyond directive counseling) such as CBT/ cognitive restructuring techniques,<sup>46</sup> which most HCPs do not provide.

### PROGRESSIVE TINNITUS MANAGEMENT (PTM)

PTM, is a multi-level approach to tinnitus management which relies on coordination between hearing care professionals and behavioral health professionals.<sup>47</sup> In a 2017 interview with James Henry, PhD,<sup>48</sup> Dr. Henry explains the levels of PTM and that PTM has evolved from the teachings and knowledge of TRT. Extrapolating from that interview, Level 1 is getting the patient to the right office with an HCP who is an expert in tinnitus diagnosis and treatment. Level 2 is the audiometric evaluation and completion of the tinnitus questionnaire and the acquisition/trial of hearing aids if appropriate. Some patients will need tinnitus-specific intervention after Level 2, some will not. Level 3 involves two sessions with an audiologist and three with a mental health provider (often using CBT) to teach skills to help patients self-manage. Level 4 is the Interdisciplinary Evaluation, which involves an audiologist and a psychologist and Level 5 is Individualized Support and services for how-ever long the patient requires them.

**Bi-Modal Sensory Stimulation.** Hypoglossal nerve stimulation (HNS) in tandem with auditory sound stimulation has emerged as a prospective avenue for mitigating tinnitus. HNS offers a novel approach grounded in the intricate neural circuitry associated with auditory processing. Recent studies have investigated the modulatory effects of HNS on the central auditory system, suggesting its potential to influence the aberrant neural activity implicated in tinnitus generation.<sup>49,50</sup> The hypoglossal nerve, traditionally recognized for its role in tongue motor control, now presents an intriguing target for neuromodulation-based interventions for tinnitus. Preliminary findings indicate that targeted stimulation of the hypoglossal nerve may induce neuromodulator effects, providing a promising

avenue for alleviating tinnitus symptoms.<sup>51</sup> As the scientific community continues to unravel the complex interplay between the hypoglossal nerve and auditory processing, HNS stands poised as a new intervention in the ongoing quest for effective strategies in tinnitus management.

**Amplification.** For people with subjective tinnitus, prescription hearing aid amplification is traditionally and most often the treatment of choice. Hearing aid amplification is well-known, relatively inexpensive, most often effective and is a safe treatment protocol when professionally managed. And as is obvious, if treating tinnitus with hearing aids is not appreciably beneficial for the patient, the hearing aids can simply be removed.

Regarding the question “Can OTC hearing aids be used as a treatment for tinnitus?” Nobody knows. Some of the issues are; people with self-perceived hearing loss may or may not have hearing loss, they may or may not have objective tinnitus, the loudness settings (gain and maximum output) of OTC products may be fine, may not be fine and may cause tinnitus to increase. However, the vast uncontrolled variables (of the consumer, the diagnosis, the product, the settings, etc.) appear to render a situation which is ill-defined and as such the results cannot (at this time) be predicted in an accurate manner.

Lybarger (2023, personal communication)<sup>52</sup> reports hearing aid amplification has been used to successfully reduce or eliminate the perception of subjective tinnitus for more than 70 years, since 1947 with body-worn hearing aids.

Kochkin and Tyler (2008)<sup>53</sup> reported almost nine out of 10 HCPs use prescription hearing aids to treat tinnitus. Regarding the hearing aid's ability to alleviate the effects of tinnitus, they report approximately 60% of patients reported minor to major relief of tinnitus and 22% receive major relief from wearing hearing aids. Fewer than 2% of patients said hearing aids made their tinnitus worse.

The American Academy of Otolaryngology – Head and Neck Surgery Clinical Practice Guideline: Tinnitus Summary statement 7 reports: “Clinicians should recommend a hearing aid evaluation for patients with hearing loss and persistent, bothersome tinnitus....To promote awareness of the beneficial effect of hearing aids on tinnitus and encourage utilization of this first-line audiologic intervention for patients with tinnitus, even those who might otherwise be marginal hearing aid candidates.”

Henry<sup>48</sup> reports “Sound can be therapeutic for managing tinnitus. The basic principle is that use of sound has the capability of promoting habituation, stress reduction, and/or distraction. And different sounds have different effects on different people.”

Tinnitus patients cannot hear their hearing loss, that is, they cannot perceive sounds their auditory system is not delivering to their brain. However, they can perceive their (often) highly correlated tinnitus. As approximately 80% of tinnitus patients have hearing loss, a comprehensive audiometric evaluation is step one in the diagnosis and treatment of tinnitus.

Professionally fitted amplification allows the professional to assure that output levels of the amplification system will not cause damage and sound loudness will remain within the comfort limits of the patient. Regarding the rationale of benefit from hearing aid amplification; increasing the background

sounds of the patient's acoustic environment (by only a few decibels) is often enough to “cover up” or “mask” their tinnitus. Hearing aid amplification allows the wearer to more easily listen, communicate and participate in conversations, thereby potentially reducing secondary stress and anxiety associated with hearing and listening difficulty and potentially improving social engagement. Another potential benefit of hearing aid amplification is that as the patient better perceives and engages with the sounds across their natural environment, they may de-focus their attention on their tinnitus.

In an important and cautionary article, Attarha, Bigelow, and Merzenich (2018)<sup>54</sup> reported in *JAMA*, there may be unintended consequences to using white noise (and other artificial) masking sounds. The authors report white noise maskers may induce maladaptive neuroplastic changes which degrades neurologic health and may negatively impact cognition. They explain that the pathophysiologic changes which accompany hearing loss and tinnitus reflect cortical dedifferentiation and these same changes result from exposure to unstructured noise. The authors report that both tinnitus and white noise may accelerate aging of the brain. They state that although noise exposure (i.e., specifically white noise) therapies may appear seductive in the short-term, they may ultimately undermine the structural and functional integrity of the auditory system. The authors suggest music or speech may suffice and they state unambiguously “Sound therapies using unstructured, random (“white”) noise should be avoided as a treatment for tinnitus.”

**Dietary and Other Supplements.** Given the profound impact of tinnitus on some individuals, it is not surprising that supplement manufacturers and retailers have offered magical pills, potions, cures, and other un-proven solutions. For licensed HCPs, it is imperative that we only offer evidence-based counsel to our patients.

The impact of tinnitus on sleep<sup>55</sup> is well documented and many tinnitus patients to turn to sleep aids. Melatonin is a hormone that plays a crucial role in regulating the sleep-wake cycle and is commonly used as a dietary supplement to help with sleep disorders, jet lag, and insomnia. There are several reports<sup>56-58</sup> noting a significant impact on sleep and overall reductions in perception of tinnitus as measured by pre- and post-tinnitus questionnaires. While the underlying mechanism of melatonin on reduced tinnitus intensity is not known; it seems logical that improved sleep quality may lead to reduced stress and, consequently, a decrease in tinnitus percept.

Currently no dietary supplement or herb has been approved for the treatment of tinnitus and dietary supplements may cause unintended or negative side effects. The latest iteration of the ‘Clinical Practice Guidelines: Tinnitus’ from the American Academy of Otolaryngology-Head and Neck Surgery (AAO-HNS, 2014) expressly recommends against the use of supplements for the management of tinnitus. Coelho, Tyler, Ji, Rojas-Roncancio, et al. (2016)<sup>59</sup> reported 1,788 subjects who responded to a questionnaire on dietary supplements and tinnitus. The authors found that the use of dietary supplements to treat tinnitus is common. Among the most common supplements are Ginkgo biloba, lipoflavonoids, magnesium, melatonin, vitamin B12, and zinc. The authors report supplements are generally not effective and should not be recommended to treat tinnitus.

### CONCLUSION/RECOMMENDATION

Writing a brief tinnitus update is impossible. Tinnitus is an extraordinarily difficult and common challenge. Tinnitus may be subjective or objective. The majority of people with tinnitus have hearing loss. Tinnitus may be soft, medium, or loud and may sound like ringing, buzzing, whistling, tonal, multi-tonal, electrical sounding, rushing, chirping, beeping, or more. Tinnitus may be localized to one ear or both, or may be central. Tinnitus may be transient or chronic, perhaps a little annoying or devastating and, indeed, life-threatening. Depending on the etiology, tinnitus may be effectively treated by in-office or surgical interventions, hearing aids, CBT, and more. In general, hearing aids offer the best tinnitus treatment option most of the time for people with and without audiometric hearing loss. New tinnitus treatments appear every year and most disappear just as quickly. Dietary supplements and other over-the-counter, natural, health-food, herbs and vitamins have not been shown to be beneficial in peer-reviewed scientific studies. In summary, despite thousands of years of tinnitus, we are still uncertain as to the best diagnostic approach and treatments. However, and equally important, we are learning more about the pathophysiology of tinnitus constantly and we are learning what does not work. Due to the innumerable uncontrolled variables associated with tinnitus, as

well as the idiosyncratic nature of people, and more so, people who are tinnitus patients, we do not anticipate a “cure” for tinnitus in the foreseeable future. However, the lack of a cure does not represent a dead-end or an impenetrable boundary to tinnitus relief, as treatment options continue to be developed, and ever-increasing new knowledge already facilitates greater than 90% successful treatment.

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References for this article can be found at <http://bit.ly/HJcurrent>.