



Charting a New Approach to Understanding and Treating Tinnitus Patients

By Hamid Djallian, MD

Recognizing tinnitus as a brain disorder influenced by multiple systems requires a fresh approach to care—one that accounts for the intricate connections between the senses, brain, body, and mind. This perspective challenges traditional notions of tinnitus, expanding beyond its roots in hearing loss to embrace its systemic and multifactorial nature.

For decades, tinnitus has been understood as a condition resulting from increased electrical activity in the hearing parts of the brain. This activity is thought to occur in response to

inner ear damage. Although this explanation accounts for some cases, it does not address situations in which individuals experience significant daily fluctuations in tinnitus loudness or experience their tinnitus worsening after specific events such as infections, medications, surgery, noise exposure, or stress. These observations suggest that a secondary process must be involved, one that influences the loudness, fluctuations or variability, and progression of tinnitus.

Emerging research has identified brain hypersensitivity, often linked to conditions like migraine, as a

significant factor in tinnitus. Studies reveal that tinnitus is two to three times more common in individuals with migraine, and similarly, migraine occurs two to three times more frequently in those with tinnitus.¹ Also, it has been shown that there is a significant association between a history of migraine headaches and ear symptoms such as tinnitus, hearing loss, and sudden deafness.² Both tinnitus and migraine also share common triggers, including stress, poor sleep, diet, hormonal changes, and environmental stimuli like sound, light, and atmospheric pressure changes.³

This overlap suggests that brain hypersensitivity, also known as central sensitivity, plays a pivotal role in tinnitus and its associated symptoms. Migraine is the most recognizable form of brain hypersensitivity, but there are other forms of increased brain sensitivity in the absence of headaches. One of these forms of brain hypersensitivity is termed *otologic migraine*, where the symptoms primarily originate in the ear, including loud tinnitus, hyperacusis, sudden hearing loss, vertigo or dizziness, Meniere's disease, and ear pressure/pain, among others.⁴

Brain Hypersensitivity: A New Paradigm

Brain hypersensitivity refers to a state in which the central nervous system becomes overly reactive to stimuli. This heightened sensitivity can cause the brain to interpret normal signals as more intense. It is often associated with conditions such as migraine, fibromyalgia, chronic fatigue syndrome, and chronic pain.⁵⁻⁷

People with brain hypersensitivity often report symptoms like loud or fluctuating tinnitus; face, head, or neck pain/stiffness; fatigue; and brain fog,

sometimes worse with stimulations like loud noise or weather changes. These symptoms may persist even in the absence of clear causes, highlighting the role of the brain in amplifying and sustaining them.

How Brain Hypersensitivity Amplifies Tinnitus

Tinnitus isn't just about the ringing in your ears—it's a dynamic interaction between your hearing system and brain. For those with greater brain sensitivity or conditions like migraine, tinnitus can become more intrusive, with loudness and perception fluctuating based on biological, neurological, and environmental factors.

Changes in Blood Flow to the Inner Ear

The trigeminal nerve, which provides sensation to the face and head, also supplies blood vessels that feed the cochlea—the inner ear hearing organ. During a migraine event, this nerve becomes active and can cause fluctuations in inner ear blood flow, temporarily reducing hearing. These changes may not cause permanent damage but can provoke a sudden spike in tinnitus loudness.

Brain Signaling: The Balance Between Excitation and Inhibition

The brain maintains its functionality through a careful balance of excitatory signals (increased activity) and inhibitory signals (decreased activity). This "excitation–inhibition balance" is crucial in keeping the brain regulated.⁸

When this balance is disrupted, as often happens in conditions like migraine or tinnitus, hyperactivity in certain neural centers of the brain increases the likelihood that neutral or meaningless signals will be misinterpreted as important and worthy of attention by the individual. This is why tinnitus often feels like a constant, exaggerated sound—it's the brain amplifying normal, neural activity into something intrusive and persistent.

Thalamocortical Dysrhythmia: A Brain Rhythm Gone Awry

Normal brain function relies on coordinated rhythms between different regions, particularly the thalamus (a relay station deep in the brain) and the cortex (responsible for higher-level processing). Thalamocortical dysrhythmia (TCD) occurs when these rhythms fall out of sync.

In TCD, slower-than-normal brain waves emerge, reducing the brain's ability to filter irrelevant signals and amplifying unwanted noise. In tinnitus, this results in the perception of sounds that are not present in the external environment; in migraine, it may contribute to hypersensitivity, such as light or sound sensitivity (i.e., hyperacusis).⁹

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The Salience Network: Why the Brain Fixates on Tinnitus

In both tinnitus and migraine, the salience network—the brain’s system for prioritizing important stimuli—can become hyperactive, leading to hypervigilance.¹⁰ When symptoms like loud tinnitus or a migraine attack happen, they trigger the fight-or-flight response, making the brain interpret tinnitus or pain signals as threats that demand attention.

This oversensitivity may increase the tinnitus’s intrusiveness and associated distress. Reducing the brain’s overreaction can help the brain ignore these nonthreatening sensations.

Neuroinflammation: The Hidden Trigger

Stress, poor sleep, illness, and even diet can create a state of inflammation, where the nerves themselves start to generate biochemicals associated with inflammation (called *neurogenic inflammation*).¹¹

When this inflammatory state occurs, it disrupts normal sensory processing and lowers the brain’s

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threshold for tolerating sensory input. For example:

- Stress releases inflammatory chemicals that sensitize the nervous system, amplifying tinnitus.
- Sleep disruption, sleep apnea, or irregular sleep schedule impairs the brain’s ability to regulate excitation and inhibition, making tinnitus more noticeable.
- Dietary factors—such as foods containing certain compounds (e.g., caffeine, tyramine)—can trigger brain processes that cause hypersensitivity, potentially worsening tinnitus perception.

Conversely, anti-inflammatory habits, like regular sleep, stress management, and an anti-brain-sensitization (migraine) diet, may help reduce these effects. (See page 17 for

more information on diet and migraine management.)

The Threshold Concept: Why Tinnitus and Migraine Fluctuate

Fluctuating tinnitus is a form of atypical migraine, swinging below or above a threshold of brain activity.¹² When the brain is balanced—blood flow is steady, brain rhythms are synchronized, and inflammation is low (low stress, good sleep, diet is nontriggering)—tinnitus may seem quieter and more manageable.

But when stressors like inflammation, sleep loss, triggering diet, or illness push the system past its threshold, tinnitus can flare up, becoming louder and more intrusive. Loud sound or weather changes among other stimulations may trigger the already sensitized brain, which can

trigger louder tinnitus. Understanding the threshold concept helps explain why tinnitus and migraine can vary from day to day or in response to specific events.

Moving Toward a Rehabilitation Model for Tinnitus

Tinnitus is a complex condition driven by multiple factors, including brain hypersensitivity and systemic imbalances. Treating it effectively requires a multimodal rehabilitation approach that integrates medical, psychological, and lifestyle interventions. In the medical literature, the shift toward multimodal tinnitus care is resulting in better outcomes.¹³

Medical Interventions

Appropriate medical interventions can lay the foundation for effective tinnitus care by addressing underlying mechanisms such as neuroinflammation, brain sensitivity, and related systemic imbalances. These interventions form the critical first step, creating the stability needed for subsequent therapies to succeed in managing tinnitus and improving overall quality of life.

Migraine Pharmacology

Medications can effectively target migraine-associated excitation–inhibition imbalances, preventing the brain from crossing the threshold that triggers symptoms.¹⁴ Long

established in migraine research, these treatments help stabilize neural activity and reduce the risk of tinnitus flare-ups. Additionally, nutraceuticals with strong clinical trial evidence can complement these medications by reducing inflammatory mediators linked to migraine.^{15,16} (Nutraceuticals are food-derived products, such as supplements or fortified foods, that provide health benefits beyond basic nutrition.)

Dietary and Lifestyle Modification

Dietary and lifestyle modification plays a vital role in managing the systemic contributors to tinnitus by addressing neuroinflammation and promoting brain health. An anti-neuroinflammatory diet, supporting gut–brain axis health, trigger management, regular moderate exercise, and stress reduction techniques like mindfulness and deep breathing help regulate the nervous system and reduce overall inflammation. These interventions, when integrated with medical care, enhance the effectiveness of treatment and improve long-term outcomes.

Sleep

Sleep plays a crucial role in managing tinnitus, as poor sleep is increasingly recognized as a significant factor in its severity. Sleep deprivation disrupts the brain's glymphatic system—a natural process that clears toxins and metabolic waste during sleep.¹⁷

Addressing sleep disorders with interventions like cognitive behavioral therapy for insomnia (CBT-I), circadian rhythm therapy, and sleep apnea treatment helps improve sleep quality and lessen tinnitus symptoms.

Physical Therapy

Physical therapy interventions are sometimes needed for people who have somatic tinnitus, where jaw, neck, or face manipulation affects tinnitus (see page 10).¹⁸ Temporomandibular joint (TMJ) dysfunction or neck stiffness can co-occur with loud tinnitus. Both TMJ and neck issues are highly correlated with migraine.

Psychiatry

Psychiatric care is also essential for individuals dealing with clinically significant mental health conditions, including stress, anxiety, depression, obsessive-compulsive disorder (OCD), or post-traumatic stress disorder (PTSD). By integrating psychiatric care into the broader tinnitus treatment plan when appropriate, clinicians can address the psychological barriers that often hinder recovery and improve overall patient outcomes.

Ancillary Treatments

While medical interventions address the foundational drivers of tinnitus, ancillary treatments should be implemented simultaneously to amplify outcomes and address the multifaceted

nature of the condition. These therapies target emotional, psychological, and sensory components, complementing medical care to create a comprehensive treatment plan. If there is hearing loss, that should be addressed by an audiologist, as hearing aids can be helpful.

Cognitive Behavioral Therapy

Cognitive behavioral therapy (CBT) is a cornerstone of tinnitus management, helping patients reframe negative thought patterns and reduce the emotional reactivity associated with life events and tinnitus. By teaching individuals to shift their focus away from distressing thoughts, CBT can alleviate the emotional burden that life events and tinnitus often impose.

Mindfulness and Stress Management

Mindfulness practices, such as meditation and progressive muscle relaxation, equip patients with strategies to regulate their emotional responses to tinnitus. These techniques help reduce stress, a major trigger for tinnitus flare-ups, and promote a sense of calm and resilience.

Sound Therapy

Customized sound therapy plays a critical role in desensitizing the auditory system. By using personalized sound therapy files, patients can reduce the prominence of tinnitus and retrain the brain to deprioritize the

tinnitus signal.¹⁹ This approach fosters long-term habituation, making tinnitus less intrusive over time.

The integration of these ancillary treatments with medical interventions creates a synergistic effect. By addressing tinnitus from multiple angles—biological, psychological, and sensory—this multimodal approach maximizes therapeutic impact, helping patients achieve meaningful and lasting relief.


The Rehabilitation Model in Tinnitus Care

Although multimodal interventions are essential for addressing the intricate web of biological, psychological, and lifestyle factors contributing to tinnitus, these approaches are fundamentally at odds with the constraints of conventional healthcare systems in the U.S., where a physician can spend only five to 15 minutes with the patient as a result of continually decreasing insurance reimbursement.

The fragmented nature of care, time-limited appointments, and singular focus on specific diagnoses prevent clinicians from implementing the comprehensive and interdisciplinary care that tinnitus patients require.

A rehabilitation model offers a practical solution to these challenges. This approach integrates multimodal care into a structured framework, ensuring that patients receive coordinated and holistic treatment. Key arguments in favor of a rehabilitation model include the following:

- **Comprehensive care delivery:** By combining medical, psychological, and lifestyle interventions under one cohesive plan, the rehabilitation model addresses all facets of tinnitus, providing a path to more effective relief.
- **Interdisciplinary collaboration:** A rehabilitation framework fosters collaboration among different



NJ is a 66-year-old who came in with severe tinnitus that started three months prior. She stated that her tinnitus used to be very quiet, on the order of 2–3 on a scale of 10, and not intrusive. After developing COVID-19, the tinnitus loudness went to a level of 7–8/10. The patient started on a comprehensive medical plan to treat the tinnitus. Dietary changes, sleep optimization, and stress reduction were instituted. Targeted nutraceuticals and medication were started for central sensitization. In general, our protocol tailors the medical therapy to the patient. This patient was treated with a combination of mirtazapine and lamotrigine. Nutraceuticals are also generally tailored to the patient and this patient received magnesium and riboflavin. After gradually escalating the medications over an eight-week period, the tinnitus returned to 2–3/10 and the medications were tapered off after the patient had been stable for eight weeks. The dietary changes were slowly relaxed with a reintroduction diet. High stress occasionally triggered loud tinnitus that was short-lasting and manageable.

specialists. This team-based approach ensures that no aspect of a patient's condition is overlooked.

- **Patient-centered focus:**

Rehabilitation prioritizes individualized care, tailoring interventions to each patient's unique needs, symptoms, and goals. This dynamic and adaptable model evolves with the patient, addressing challenges and progress as they arise.

- **Enhanced accessibility and adherence:**


Regular check-ins, motivational coaching, and rehabilitation support patients in adhering to their care plans, overcoming barriers, and maintaining long-term engagement. Telemedicine is perfectly suited for this level of care.

- **Systems-based approach:**

Recognizing tinnitus as a systemic condition, the rehabilitation model moves beyond symptom management to address underlying mechanisms like neuroinflammation, brain hypersensitivity, and sensory processing dysfunction.

Ultimately, shifting to a rehabilitation model aligns the complexity of tinnitus with the equally comprehensive care it needs. By embracing this approach, clinicians can overcome barriers to multimodal care and deliver meaningful relief and improved quality of life for tinnitus patients. This is not just a shift in treatment—it is a necessary evolution toward a new standard of care for one of the most challenging and misunderstood conditions.

Conclusion: A Call for a New Standard of Care

Tinnitus is more than a hearing disorder—it is a systemic condition influenced by brain hypersensitivity (called atypical or otologic migraine) and interconnected systems within the body. Recognizing this complexity requires a shift in both the strategy and delivery of care, a move toward a multimodal rehabilitation model. By integrating medical, psychological, and lifestyle interventions, this model addresses the root causes of tinnitus and empowers patients to reclaim their quality of life. 



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Complete references can be found here.



KS is a 39-year-old with long-term low-level tinnitus that suddenly became worse after taking a flight. Since then, the loudness of his tinnitus fluctuates from 2–3 on a scale of 10 to 8–9 on different days. The patient was started on the central sensitization protocol. Central sensitization protocol involves optimization of sleep (correction of circadian rhythm disorder), stress reduction techniques through cognitive behavioral therapy, and dietary changes (improved hydration, avoidance of hunger, and avoidance of foods that contain neurotransmitter-like molecules), nutraceuticals, and medications. This patient received a combination of desipramine and verapamil for medications and nutraceuticals included magnesium and riboflavin. After about six weeks, the fluctuations became less frequent, and approximately three months after the onset of treatment, all fluctuations stopped, and the tinnitus returned to a low baseline of 2–3/10. The medications were tapered off over an eight-week period, but occasional flare-ups occurred from stress and increased caffeine consumption that were controlled. One flare-up required restarting medication (mirtazapine), which was then tapered off after six weeks after it settled the tinnitus flare-up.