



# Optimizing Tinnitus Retraining Therapy Success

by James A. Henry, Ph.D.

Tinnitus affects many U.S. military veterans as a life-impacting condition. Tinnitus also presents a major challenge to the VA, which provides tinnitus disability compensation of \$172,721,000 per year to over 162,000 veterans with service-connected tinnitus. Researchers at the National Center for Rehabilitative Auditory Research are addressing this rapidly escalating problem by developing techniques for the clinical management of veterans who suffer from tinnitus. A randomized clinical trial is currently being completed that is documenting the clinical effectiveness of two popular methods for treating tinnitus: tinnitus masking and tinnitus retraining therapy.

Tinnitus retraining therapy (TRT) has received worldwide recognition since its first description by Dr. Pawel Jastreboff in 1990. Through our work in treating patients with TRT, we have become aware of a number of issues that seem to be essential for patients to receive maximum benefit from this program.

## The Neurophysiological Model

TRT is based upon the “neurophysiological model” which portrays tinnitus as a problem involving various interacting brain structures – not just the hearing system. Many reports estimate that tinnitus is not a problem for about 80% of the people who have permanent tinnitus. The neurophysiological model suggests that for the remaining 20% of individuals with permanent tinnitus, parts of the brain other than the hearing system become activated to a significant degree. And for these 20%, tinnitus is a significant problem. These “other” brain areas are responsible for our emotional and stress responses – the kind of responses that create a clinical condition of tinnitus.

## Habituation

TRT is successful for a patient if the treatment facilitates “habituation” of tinnitus. What is habituation? Our brain and nervous system learn to ignore sounds (or other types of sensations) that have no connection with anything negative. For example, we don’t actively listen to air conditioners or other continuous background sounds. Such sounds are simply part of the background sound environment. The goal of TRT is to render tinnitus to the status of a meaningless background sound that is easily ignored. Successful habituation to tinnitus would result in a patient commenting, “I haven’t noticed my tinnitus all day,” or “I haven’t noticed my tinnitus in days.” If there is no awareness of tinnitus, the tinnitus is not a problem.

## Directive Counseling and Sound Therapy

To achieve habituation, TRT utilizes “directive counseling” and “sound therapy.” The directive counseling is a structured approach to educate patients primarily with regard to how the brain and auditory system are involved in tinnitus. The counseling aims to remove any fears or anxieties that patients have about their tinnitus.

The counseling is repeated at all follow-up appointments.

The purpose of sound therapy is to “enrich” the patient’s sound environment to facilitate the process of tinnitus habituation. For more severe cases, sound therapy is accomplished through the use of wearable ear-level sound generators or, in cases of significant hearing loss, hearing aids or combination units. To understand how sound therapy works, it is important to understand various aspects of how we hear.

*Activity in the Hearing Nerve.* The hearing nerve, or auditory nerve, connects the inner ear (cochlea) to the lower part of the brain (brainstem). The auditory nerve contains thousands of nerve fibers. Each fiber’s only function is to transmit electrical discharges – like firing a gun. The brain interprets the pattern of these discharges as the sounds that we hear.

*Activity in the Auditory Nervous System.* Everything we hear is the result of sounds causing vibrations in the cochlea. These vibrations are converted to electrical impulses that are carried through the auditory nerve and up through the brain. The electrical signals, representing sound, are “processed” in the lower parts of the auditory nervous system prior to the person becoming conscious of the sound at the upper part of the auditory nervous system. An important function of the lower, or subconscious, portion of the auditory nervous system is to deliver only the most important signals to the brain’s cortex, and to block all others. How does that happen?

*Filtering of Signals in the Auditory Nervous System.* The subconscious part of the auditory nervous system works like a computer that sorts, organizes, and routes the different signals to provide the cortex with the information needed for survival and well being of the whole body. As part of this process, signals are filtered out that contain information that is irrelevant for survival and well being. Those signals, such as signals for the sound from an air conditioner, are blocked from reaching a person’s consciousness. This blocking/filtering function enables a person to concentrate on what is most important for efficient functioning of the body.

*Rationale for Sound Therapy.* In the auditory nervous system, each of the many thousands of nerve fibers emits discharges spontaneously, even in the absence of sound. Wearable sound generators deliver a low level of random sound directly to the ear, which forces the auditory nerve fibers to fire at a higher rate than they would in quiet conditions. This heightened level of activity reduces the contrast between the tinnitus and the background sound because the tinnitus signal then appears more similar to the random signals surrounding it. The reduced contrast causes the tinnitus signal to be less “detectable” within the auditory nervous system.

*Brain Plasticity and Habituation.* Plasticity refers to the brain’s ability to “rewire” itself based on changes in its functioning.

## Optimizing Tinnitus Retraining Therapy Success continued

When an individual learns something new, there are changes made in the wiring (the synapses) of the brain. Habituation is a learning process, and it can take months or years to habituate to signals that one has been sensitized to respond to in a negative way. The brain must become rewired or “retrained” as it learns to habituate the tinnitus signal.

**Optimizing Success with TRT** To achieve maximum success with TRT, compliance with the program is essential. Patients are told by their clinicians to not expect any progress during the first few months, but that progress should be gradual beyond that point. Tinnitus retraining therapy is not a “quick fix” program. For the most severe cases, much patience may be required over a year or two before benefit is realized.

From our experiences, we feel that the following are the most likely reasons that patients may not attain maximum progress with TRT:

- 1. Wearing the sound devices for insufficient time periods.** The sound generators, hearing aids, or combination units should be worn during all waking hours. There will be times when this is not possible, such as during showering or swimming. Unless there is a physical reason why the devices cannot be worn, they should be in the patient’s ears and turned on.
- 2. Incorrectly adjusting the levels of the sound generators.** For patients who use sound generators, the output of the generators must be set to the “mixing point” at the time they are placed in the ears. Patients are often confused about how to achieve the mixing or blending level, and it is often noted during follow-up appointments that patients have been setting their levels improperly. Reinstruction from the clinician regarding these adjustments is one of the many reasons why regular follow-up visits are essential.
- 3. Readjusting the sound generators throughout the day.** During follow-up visits, patients often report that they constantly monitor the output levels of their sound generators and that they make changes to readjust the levels. This happens to patients because, as the loudness of their environmental sounds fluctuates, the loudness of their sound generators also seems to fluctuate. For example, when driving, road noise may obscure the sound from the sound generators, which could cause the person to feel that the generators need to be increased in volume.  
The sound generators that are used with TRT were selected partially because they provide a stable output of broadband sound. After making the initial adjustment to their sound generators, patients must adopt the “set-and-forget” philosophy and never readjust their devices after they are in the ears.

- 4. Not Enriching the Sound Environment 24/7.** In addition to wearing the sound generators, hearing aids, or combination units, patients must also attempt to enrich their sound environment 24 hours a day, seven days a week.

Sleep time is a long period every day during which background sound enrichment is especially important since the devices are usually not worn during this period (although it is allowable if patients so choose). Patients should have some sort of bedside device that produces constant, low-level sound that does not interfere with sleep. The objective is to use some type of sound to reduce the contrast that would otherwise exist between the person’s tinnitus and the background silence of the bedroom. New types of bedside sound devices continue to appear on the market, including some that are combined with alarm clocks. The patient can also use a CD player for this purpose. There is an extensive selection of nature sounds on CD that can be played continuously. Tabletop fountains, “pillow speakers,” or fans can also be useful to enrich the bedroom sound environment.

- 5. Not attending regular follow-up appointments.** The importance of follow-up appointments cannot be overemphasized. Patients can (and often do) forget a lot of what they are told during the initial counseling. Follow-up visits give clinicians the opportunity to restate the key counseling points and re-instruct patients in the use of sound generators.

### Final Advice

If you are a TRT patient, the principles above should serve as a reminder of the key points of the program. It is also important to continue enriching your sound environment beyond the duration of the program. If you wear sound generators, wear them for longer than you think you need them to ensure that the retraining is firmly established. Finally, stay in touch with your clinician and make inquiries whenever you have questions or concerns. The bottom line is to be proactive in doing all you can to help yourself.

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