

Frequently Asked Questions concerning TRT (Tinnitus Retraining Therapy)

The questions included here will give you only a general outline of the treatment. Please read carefully the detailed information included in the package. You are welcome to visit Dr. Jastreboff's website <http://www.tinnitus-pjj.com/>

How do you treat tinnitus?

Our treatment is called *Tinnitus Retraining Therapy*, but other names such as habituation-oriented therapy, tinnitus treatment based on a neurophysiological model, and "Dr. Jastreboff's treatment" are used as well. It involves an extensive audiological evaluation, several counseling sessions, the use of external sound, and frequently the use of sound devices. It does not involve any surgery or drugs.

What does *retraining therapy* mean?

We try to retrain the subconscious parts of the brain to ignore the sound of your tinnitus and to achieve the stage in which you are not aware of and annoyed by your tinnitus.

Are there any side effects of the treatment?

There are not side effects.

What kind of audiological tests are performed? Will it hurt my ears? What if I don't have tinnitus when I am tested?

The tests include an audiogram and several specific tests which will allow us to evaluate whether you have tinnitus and/or Hyperacusis, and to what degree. The tests begin with low levels of sound and gradually get louder; therefore, none of the tests will be painful. If the tinnitus is not present on the day of the testing, it will NOT influence the possibility of success with the treatment.

I recently had audiological test done. Do they have to be repeated?

We prefer to have the tests performed at our clinic. Equipment calibrations may vary, and there are also very specific measurements we perform which are not routinely provided in other places.

Is the counseling a form of psychotherapy or biofeedback?

No, the counseling will provide you with information about the causes and factors involved in your tinnitus/Hyperacusis, explain to you how the retraining works, and teach you how to control your tinnitus. The counseling session is a fundamental part of the treatment process.

Is this treatment covered by insurance?

In general, no. Some insurers may cover part of the evaluation and sometimes the devices. The Care Card does not cover it. You may call or write your insurance company and check with them as to your coverage and possible reimbursement.

I am using retraining therapy for my tinnitus. I need to have some dental work done, which involves high speed drilling. Can I have it done and what can I expect?

You should contact the Center and the person who is working with you. High-speed dental drills produce loud sound, which is transmitted not only by the air, but also by bone conduction. This sound may increase tinnitus (in most cases temporarily). In general, it would be better to avoid loud drilling, if possible. There is a new, and still controversial, quiet technology called air-abrasive micro dentistry, which you might like to explore and seek more information about from dental professionals.

I am using retraining therapy for my hyperacusis. I need to have some dental work done, which involves high speed drilling. Can I have it done and what can I expect?

You should avoid exposure to the loud sound. We have Hyperacusis patients whose condition worsened after high speed drilling.

I was advised to have an MRI screening done. Can I expect any problems with my tinnitus and Hyperacusis?

If you need to have an MRI done, we advise you not to use a close field (if possible), but an open field MRI and protect your ears as well. Unfortunately, we have to make you aware that some of our patients have reported that their tinnitus/Hyperacusis started or became unbearable after MRI exposure.

Can cosmetic facial surgery affect my tinnitus and/or hyperacusis?

There is no reason to suspect that this procedure will have any effect. I would try to postpone the surgery if it involves drilling or is in very close proximity to the ear.

What is the role of external sound?

External sound from radios, TVs, stereos, etc. is used at a low level, not to cover (mask) your tinnitus, but to help bring about the changes in your subconscious hearing system. It reduces the contrast between your tinnitus and complete silence, and slightly distracts you from the sound of your tinnitus.

What are the devices and what do they look like?

The devices used in retraining therapy are called “noise generators” or “sound generators.” The devices are small instruments that are worn behind both ears. They look similar to the behind-the-ear hearing aids and can be worn with glasses. They should not interfere with your work or talking on the telephone. In the ear sound generators are also available now.

Can I just buy the devices?

The devices are used to help speed up the process of retraining, but what is important is how they are used. The manner in which the devices are used depends on each patient’s individual needs. If you just buy and wear the devices, you most probably will not achieve improvement, and in some cases you may even hurt your ears. We will teach you how to use them effectively.

Do I need to have the devices?

Not every patient needs the devices. After the medical and audiological evaluation, we will give you our recommendations and you can choose your treatment.

I am using hearing aids; how can I use other devices?

Depending on the type of hearing aids, it is possible that we can work with your hearing aids and you will not need any other devices.

I was using maskers without effect. What is the difference between masking and these devices?

Although in some cases masking can provide tinnitus relief, this approach is aimed at making tinnitus inaudible. However, when the device is removed, the tinnitus returns and the level of sound required to mask the tinnitus might be uncomfortable. We use the devices to generate noise, not to cover the sound of tinnitus. The goal of retraining therapy is to retrain the brain so that it eventually does not pick up the tinnitus sound, and in order to do this the tinnitus sound cannot be covered. Generating sound that mixes with your tinnitus will help you feel more comfortable and remove the emotional response to tinnitus, and then the perception of tinnitus itself so that it is no longer heard.

THEORETICAL BASIS OF OUR APPROACH TO TREATING TINNITUS AND HYPERACUSIS

Taken from the book chapter, "Treatments of Tinnitus Based on a Neurophysiological Model of Tinnitus". P.J. Jastreboff and J.W.P. Hazell, in the book Treatments of Tinnitus, 1997, J. Vernon editor, ISEN-0205182690. Reprint permission granted by Allyn & Bacon. To order single copies of Treatments and Tinnitus, call Allyn & Bacon publishing: 1-800-278-3525.

Tinnitus is a common phenomenon that affects about 17% of the general population and about 33% of the elderly. Until recently, tinnitus did not receive sufficient attention, both in clinical practice and in research. While the perception of tinnitus is very real, there is no external sound corresponding to the patient's perception of the sound; thus, tinnitus can be classified as a phantom auditory perception. Consequently, there is no objective measurement of tinnitus.

Much effort has been committed to the psycho acoustical description of tinnitus, such as: its pitch, loudness, whether it is perceived in one ear, both ears, or in the head, the minimal level of noise needed to suppress its perception, "how it sounds", etc. The expectation was that these measurements would establish different categories of tinnitus, where for each category a specific treatment could be applied with a predictable outcome. This expectation has not been fulfilled, but nevertheless the efforts have provided interesting, while counterintuitive, results.

One important result was the psycho acoustical characterization of tinnitus has no relation to the level of annoyance evoked by tinnitus. In other words, two people with a very similar psycho acoustical description of tinnitus can differ dramatically in their level of annoyance induced by tinnitus: One person ignores tinnitus and is not aware of it and is not annoyed at all, while the other person is constantly aware of tinnitus and has difficulty focusing their attention on work, falling asleep, and enjoying life.

Approximately 75% of all the people who experience tinnitus are not bothered by it, and they treat tinnitus like any other sound to which they easily habituate. The important aspect is that there is no difference in the psycho acoustical characterization of tinnitus between those who experience tinnitus and those who suffer because of it. This observation is one of the findings responsible for the development of a new model of tinnitus, and based on the model, Tinnitus Retraining Therapy.

The model is based on basic, well-established neurophysiological and psychological principles. Mainly: 1) the processing of information occurs on different levels for each sensory system, each level contributing to the final stage when a signal reaches the cortex; 2) the auditory system is closely connected with the part of the brain that controls emotions and the automatic response of the body to danger; 3) connections within the nervous system are continuously modified, resulting in the enhancement of significant signals, and a decrease of

neuronal response to irrelevant signals; 4) sounds that are new, or associated with a negative experience, are treated as significant; evoke an emotional response that triggers the body to prepare for “fight or flight.” The repetition of these sounds results in the enhancement of their perception to be suppressed by other signals. The repetition of signals not associated with positive or negative reinforcement results in the disappearance of a response to their presence, i.e. habituation: 5) the detection of sound occurs on a pattern-matching principle, allowing for nearly complete perception of a signal even when it is highly distorted.

The main point of the theory of tinnitus based on these neurophysiological principles is the postulate that non-auditory systems, particularly the limbic system (involved in emotion), and the autonomic nervous system, which controls all body functions and triggers the “fight or flight” reaction, are an essential part in each case of troublesome tinnitus. The auditory pathways play a secondary role. According to this model the annoyance of tinnitus is determined exclusively by the limbic and autonomic nervous system.

The following scenario of the emergence of tinnitus perception has been proposed (*Neurosci.Res.* 8:221-254, 1990). A weak imbalance of neuronal activity within the auditory system, most frequently related to damage of the inner ear, is detected at low levels in the auditory system, and being a new signal it is further enhanced by sub cortical centers, transferred to the auditory cortex and perceived as a sound- tinnitus, and is subsequently evaluated by the brain. In the majority of cases, the continued presence of tinnitus combined with a lack of any positive or negative association results in the habituation of the reaction to the tinnitus signal. Although tinnitus perception may still be possible, there is little or no annoyance or discomfort. This situation is typical for children, or those leaving a loud concert, which tends to treat tinnitus as a natural event, and it typically does not annoy them.

However, in some cases, the perception of tinnitus is associated with a negative emotion. Patients treat tinnitus as an indicator that something is wrong with their hearing, or their brain, and as a result, they start to focus their attention on the tinnitus. Quite frequently, this occurs as a result of “negative counseling.” All too often, healthcare professionals advise patients to check for a brain tumor, or indicate that tinnitus is basically a psychiatric condition, or tell the patient, “nothing can be done with tinnitus” and that the patient has to “learn to live with it.” This negative reinforcement of tinnitus perception actually enhances the initial responses of the autonomic nervous system evoked by fear. As tinnitus is commonly continuously present and evokes a strong emotional response, this results in tuning of the neuronal networks detecting the tinnitus signal itself. Consequently, this increases the time an individual is aware of the tinnitus and further enhances the aversive emotional responses and the reaction of the autonomic nervous system, thus increasing annoyance. Notably, the involvement of the limbic and autonomic nervous systems is responsible for the annoyance

evoked by tinnitus; the loudness and pitch of tinnitus are irrelevant to a large degree and normally do not play a significant role.

For many patients, the compensatory action of the auditory system results in the emergence of Hyperacusis. Research on animals has revealed that often permanent or temporary hearing loss; about 25% of the neurons in the subcortical centers show increased sensitivity. These data are in agreement with human data, which shows that if a person is put in a chamber with a very low sound level, the sensitivity of hearing increases, all sounds start to sound loud, and 94% of the people develop temporary tinnitus. These data indicate that tinnitus can result from enhanced sensitivity of the auditory system, which in turn may lower the maximum sound level that a person finds comfortable. For these patients, tinnitus and Hyperacusis are two manifestations of the same internal problem. In clinical practice, the contribution of the Hyperacusis component to tinnitus ranges from none at all to the situation where Hyperacusis is the only, or dominant, problem.

From the patient's point of view, the crucial question is what can be done to remove the tinnitus-evoked annoyance. To our knowledge, there is no drug, procedure, or surgery that can eliminate the source of tinnitus permanently if it's associated with the inner ear. As evident from the model, even in cases with significant damaged inner ear contribution, attempts to solve the problem by destroying the cochlea or auditory nerve would not be consistently helpful, while making the patient deaf. To make the situation worse, it has been shown that cutting the auditory nerve, which is still promoted by some as a treatment for tinnitus, actually causes tinnitus in close to 60% of the people who did not experience tinnitus before the operation. Another problem arises from the observation that quite frequently more than one type of tinnitus coexists and therefore we would need to attenuate all various sources of tinnitus. An important property of our approach, Tinnitus Retraining Therapy (TRT), is that it cannot create any harm.

The TRT, which was developed by Dr. Jastreboff in the mid '80s and published in 1990 (Jastreboff, P.J. Phantom auditory perception (tinnitus): mechanisms of generation and perception. *Neurosci.Res.* 8:221-254, 1990), offers a potential solution to this problem. If we cannot erase the source(s) of tinnitus, we should turn our attention to what is happening between the source of tinnitus (most frequently at the periphery) and the level where tinnitus is perceived- the cerebral cortex. The idea is to block tinnitus-related neuronal activity from reaching the level of the cortex where it is perceived, and from activating the limbic and autonomic nervous systems- to habituate tinnitus perception and tinnitus-induced reactions.

Everyday experience and research show that we are consciously aware of only a small portion of incoming sounds. Although other sounds evoke changes in neuronal activity within the auditory pathways, the neuronal networks filter out

this activity before they reach the level of conscious perception. Similarly, most sounds do not evoke any emotional reaction or activate the autonomic nervous system.

To understand how tinnitus emerges, it is helpful to understand how sound is processed in the auditory pathways. In the absence of sound, there are high levels of neuronal activity in the auditory nerve, as well as in other neurons in the auditory pathways, but this activity is random. The nervous system filters out this activity and therefore we do not perceive it as sound. This random activity can be considered as a “code of silence.”

When we are exposed to sound, the activity within the auditory system increases and becomes more regular and synchronized. While the patterns of electrical activity within the auditory nerve closely reflect the sound that reaches our ear, this activity undergoes extensive processing in several sub-cortical centers within the auditory pathways before reaching the cortex, where perception of the sound occurs.

It has been observed that this processing of information can itself result in changes in the connections within the brain that are involved in transmitting signals from the ear to the cortex. In other words, repeated activation by a sound not associated with anything of significance will result in decreased activation of the cortical and limbic areas, whereas sound associated with a significant event, particularly related to danger, will be enhanced and will strongly activate the cortical areas and emotional response. Our brain sorts sounds according to their significance. Notably, the rules controlling this sorting can change, and with proper training we can either enhance our perception of some sounds, or train our brain to filter out other sounds.

Accordingly, if we can train the brain to classify tinnitus-related neuronal activity as representing a neutral, non-significant signal, then the process of habituation will occur automatically. To achieve this, it is necessary, however, to fulfill two basic conditions: 1) removal of the negative association attached to the tinnitus perception, and 2) preservation of tinnitus detection (but not necessarily perception) during treatment.

The first condition results from the observation that signals that induce fear, indicate danger, or that are associated with any unpleasant situation cannot be habituated. To avoid unpleasant situations, we must not habituate sounds that provide warning! The decreased negative association of tinnitus is achieved through directive counseling, with emphasis on teaching the patient the basic function of the auditory system and the brain in relevance to tinnitus. This is performed because a known danger evokes a weaker reaction of the autonomic nervous system than an unknown danger. The reactions of the autonomic nervous system are responsible to tinnitus annoyance, and decreasing these reactions is a primary goal of the therapy.

The second condition is less obvious, but equally important. For retraining the neuronal networks involved in processing the tinnitus signal, it is fundamental that tinnitus-related activity can be detected during treatment. We cannot, by definition, achieve retraining of something that cannot be detected! Thus, for this habituation-oriented therapy “masking” of tinnitus (completely covering the tinnitus sound by a louder sound) is counterproductive. Indeed, preliminary results of a study presently conducted on patients who used masking for 10-15 years fully confirm this statement. In these patients, tinnitus and its annoyance did not change in all these years. Once they were switched to a habituation-oriented therapy, they achieved tinnitus habituation within a year.

Low level, broadband sound is used to facilitate tinnitus habituation. It was mentioned previously that 94% of the people placed in a very quiet environment develop temporary tinnitus. Silence actually enhances tinnitus and Hyperacusis. All our patients are advised to avoid silence and immerse themselves in a low level, emotionally neutral sound environment. The sound used in TRT can be of various origins, but for both theoretical and practical reasons we are using broadband noise generated by devices, which are worn behind the ear.

The process of retraining takes 12-18 months. However, once tinnitus habituation is achieved, there is no need for continuing the treatment.