

AN INTRODUCTION TO WIDEX ZEN THERAPY

It is known that there are many non-auditory and psychological ramifications from hearing loss that may lead to increased stress (Kochkin, 2005; Kochkin and Rogin, 2000). The incidence of increased stress is reportedly higher in people with hearing loss than for the normal-hearing population (Fellinger, et al, 2007). In fact, Evans and Cohen (1987) have documented increased blood pressure and higher stress hormone levels in hearing-impaired individuals.

One method of relieving stress, and inducing relaxation, is the use of music. Burns et al (1999) reported that listening to music can result in physiological changes correlated with relaxation and stress relief. Patterns of musical elements, such as slower tempo, lower pitch, degree of repetition, and lack of emotional content have been established as having a calming, rather than alerting effect (Bella, et al 2001; Hevner, 1933, 1936).

Widex introduced Zen fractal tones, a melodic chain of tones that repeat enough to sound familiar and follow appropriate rules, but vary enough to not be predictable, into some of its hearing aids several years ago. Fractal tones utilize harmonic relationships, and are generated by a recursive process in which an algorithm is applied multiple times to process its previous output (Beauvois, 2007). Like music, they have the capacity to relax people, and adhere to certain rules of music as they relate to emotion. Kuk and Peeters (2008) provided evidence that hearing-impaired patients found Zen fractal tones to be relaxing.

One of the most common sequelae of hearing loss is tinnitus. Tinnitus is a disorder characterized by the phantom perception of sound. The fact that the vast majority of individuals with chronic tinnitus show at least some degree of hearing loss (Ratnayake, et al, 2009) has led to speculation that tinnitus perception is related to auditory deprivation. It is believed that the central nervous system reacts to the lack of neural stimulation from the ear by increasing its "attentiveness" to the auditory signals that do reach it, with consequent awareness of sounds arising from previously subconscious abnormal neural activity in the system. This increase in central nervous system gain has been confirmed in studies by Kaltenbach et al (2005) and Eggermont and Roberts (2004). It is believed that one of several reasons why hearing aids providing amplification in the region of the hearing loss are so helpful in providing tinnitus relief (Surr et al, 1985, Saltzman and Ersner, 1947, Kochkin and Tyler, 2008, Searchfield, 2006) is that the increased neural stimulation decreases the higher central auditory regions' need to "overcompensate" for the peripheral attenuation.

Tinnitus also has an extremely high correlation with stress. Stress increases tinnitus distress, while the negative reaction patients have to tinnitus increases stress. Two recent publications have further demonstrated the symbiotic relationship of hearing loss, tinnitus, and stress. Kochkin et al, 2011, reported that of nine tinnitus treatment methods assessed (hearing aids, music, medication, relaxation exercises, counseling, non-wearable sound generators, herbs and dietary supplements,

wearable sound generators, and psychological counseling), the most substantial tinnitus amelioration was achieved with hearing aids (34%), followed closely by the use of music (30%). No other treatment achieved an efficacy rating of more than 10%. Baigi et al, 2011, investigated the relationship between noise (another known contributor to tinnitus), and stress on 2,024 individuals with tinnitus, and reported that while exposure to noise and stress were both important for the probability and level of discomfort from tinnitus, stress was the more important factor for the transition from mild to severe tinnitus. They concluded that stress management strategies should be included in hearing conservation programs, especially for individuals with mild tinnitus who report a high stress load. In addition to these auditory and/or neural based processes, activation of the limbic system, due to association with fear and threat, greatly contributes to increased stress, and tinnitus related anxiety. This also helps to create the attention and emotional issues which are important factors in tinnitus perception and distress.

Thus, it is only logical that the use of music, amplified in accordance with an individual's hearing loss, might be an effective method of providing tinnitus relief. With this in mind, the potential application of Zen fractal tones delivered via high-fidelity hearing aids was explored by Sweetow and Henderson Sabes (2010) in an experiment to determine whether the presence of various acoustic stimuli, including fractal tones, delivered through a hearing aid would 1) be perceived as relaxing to tinnitus patients, 2) reduce short-term tinnitus annoyance, and 3) lower subjective tinnitus handicap and reaction scores in a six-month field trial. The protocol allowed for a comparison of fractal tones alone, fractal tones combined with amplification, broadband (white) noise alone, broadband noise mixed with amplification, and fractal tones along with amplification and broadband noise. Results indicated that fractal tones were effective in promoting relaxation and reducing annoyance from tinnitus. Both fractal tones and broadband noise reduced tinnitus annoyance, but the fractal tones were preferred by subjects for longer-term use. In addition, while the majority of subjects selected slower tempos for relaxation and long-term wear, this choice was not unanimous. This underscores the benefit of providing the individual listener with choices. Since then, a survey by Kuk et al. (2010) and a further study by Herzfeld and Kuk (2011) confirmed similar positive results, along with showing long-term relief.

Given these positive results, Widex has decided to take the Zen sound-based tool a step further by creating a program - Widex Zen Therapy - that directly addresses the components of tinnitus distress (auditory, attentional, and emotional) as well as the major issues

that contribute to the distress experienced by tinnitus patients (hearing loss, sleep deprivation, maladaptive thoughts and behaviors, and excessive stress). Our integrated approach therefore incorporates not only the optimal segments of existing therapies, but also novel acoustic stimuli and relaxation exercises.

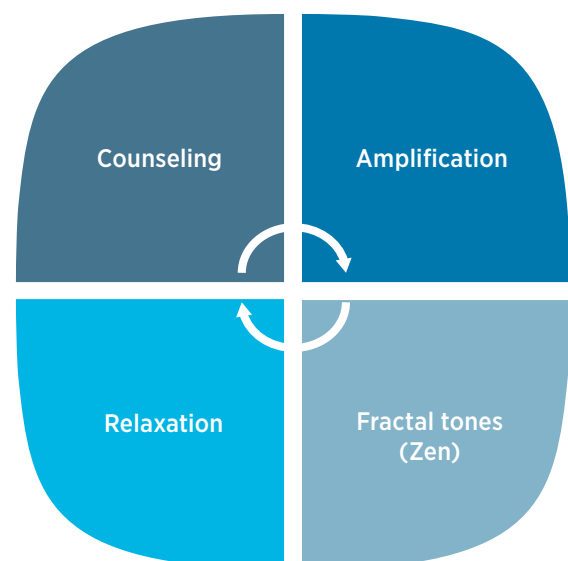
- The overall objective of Widex Zen Therapy is to ensure that the tinnitus does not negatively impact the patient's quality of life!
- It does not purport to be a cure, or to suppress tinnitus (though it sometimes produces that effect).

Components of Widex Zen Therapy

Because it is well accepted that the distress related to tinnitus is highly correlated with hearing loss, negative emotions, fear, and stress, it is important to address these issues. Widex Zen Therapy thus incorporates:

1. **Counseling**, both instructional and adjustment-based, to educate the patient and assist the limbic system to alter the negative interpretation of the tinnitus via cognitive and behavioral intervention;
2. **Amplification** to stimulate the ears and brain in order to minimize increase in central activity (overcompensation) and maladaptive cortical reorganization;
3. **Fractal tones** - a novel, proven acoustic stimulus delivered dichotically in a discreet, inconspicuous and convenient manner, designed to both relax and provide acoustic stimulation;
4. **Relaxation strategy program** highlighted by behavioral exercises.

Each of these components is briefly outlined in the following section.



The components of Widex Zen Therapy

Counseling:

Instructional counseling helps to educate the patient about aspects of the tinnitus itself. For example, it addresses:

- the basic anatomy and physiology of the auditory (and central nervous) system,
- **why** the tinnitus is present (particularly when it is a normal consequence of having a hearing loss),
- **what** the logical course of the tinnitus might be,
- **how** the limbic system affects the tinnitus perception and **how** the patient's reaction impacts the ability to cope with or habituate to the tinnitus.

Adjustment-based counseling helps the patient to recognize aspects of how the tinnitus is affecting him or her, and the cognitive and behavioral implications. For example, it is designed to :

- **address** the emotional sequelae of tinnitus, including fear, anxiety and depression,
- **identify** and correct maladaptive thoughts and behaviors,
- promote **understanding** of the relationship between tinnitus, stress, worry, behaviors, thoughts, and quality of life.

Features of Cognitive Behavioral Therapy (CBT), a technique long used for patients with chronic pain, can be used for adjustment-based counseling. The goal of this intervention is to modify maladaptive (unhelpful) thoughts and behaviors by applying systematic, measurable implementation of strategies designed to alter unproductive actions. CBT helps patients to identify thoughts (the cognitive portion) and behaviors (the behavioral portion) that sustain negative reactions, and provides strategies to help to alter these thoughts and behaviors. In Widex Zen Therapy, cognitive behavioral intervention strategies are utilized to assist those patients for whom this type of intervention can be helpful. In addition, Widex Zen Therapy includes specific sleep suggestions, in order to address one of the most common negative consequences of tinnitus.

Amplification:

As described earlier, hearing aids can be very effective in decreasing the perception of tinnitus because 1) the increased stimulation sent to the cochlea, and ultimately the auditory cortex, can minimize the brain's attempt to "overcompensate" for the lack of stimulation by turning up its sensitivity, 2) they partially mask tinnitus, and 3) they reduce contrast between tinnitus and silence.

While most well-fitted, high-quality hearing aids can help tinnitus patients with hearing loss, Widex hearing aids are particularly effective because of their low

compression thresholds, broad bandwidth, precision in fitting procedure (Sensogram), and in-situ verification (SoundTracker).

Zen Fractal tones:

Music affects people in different ways, due to inherent and learned preferences. Research has shown that the use of previously-recorded music may have limitations in stress reduction, because familiar music can evoke memories and potentially negative emotions and create unwanted distraction. Active listening may have a tendency to arouse some patients, however, so when possible, it may be preferable to use a passive listening approach to capitalize on the natural ability of the brain to habituate to a non-salient, non-threatening stimulus. In addition, few people have the luxury of actively engaging in an active therapeutic approach, particularly one that requires use of visible earphones, for much of their waking and working hours. Thus, it can be argued that the use of music for subconscious relaxation and reduction of the stress that may be present in tinnitus should not be actively distracting. Moreover, since there are personal preferences, neutral music should not have emotional associations.

An alternative approach to pre-recorded music that incorporates the benefits and rules of music but avoids these potential limitations is the use of fractal tones. Fractal technology (Zen tones) ensures that no sudden changes appear in tonality or tempo. They repeat enough to sound familiar and follow appropriate rules, but vary enough to not be predictable. The tones (which sound somewhat like wind chimes) are thus pleasant, but are not associated with music that the listener may hold in memory, and they incorporate the properties of music that have been proven to be most relaxing. By filtering these sounds in accordance with an individual's hearing loss, and delivering them in an inconspicuous manner via high-fidelity hearing aids, hearing needs and stress management can both be addressed. Moreover, and importantly, a variety of flexible choices are available that differ in terms of tempo, pitch, dynamic range, and chord.

Zen also contains a broadband noise that can be mixed together with the Zen tones or played alone.

Relaxation strategies:

Because stress decreases the ability of a patient to cope successfully with tinnitus, and since stress is often manifested as a tightening of muscles, a variety of approaches designed to help a patient relax have been used for tinnitus patients. Furthermore, the connection between somatic influences, such as tightening the jaw, grinding the teeth, or contracting neck muscles, can lead to increased tinnitus perception. Teaching the patient how to quickly recognize changes in muscle

tension, and how to implement immediate methods of relaxing those muscle groups, can be very helpful. In addition, practicing relaxation exercises, such as deep breathing and progressive muscle relaxation, can help to reduce and manage excessive overall stress.

The Zen acoustic signals will provide the listener with a relaxing background, but if the patient is going to truly break the vicious cycle of tinnitus and stress, proven relaxation exercises should be used. We therefore suggest that each patient who has a negative reaction to tinnitus, or who demonstrates the need for stress reduction, should be prescribed and taught relaxation techniques. Widex Zen Therapy instructs the patient in three simple but effective relaxation methods: deep breathing, progressive relaxation, and guided imagery.

An extensive Widex Zen Therapy manual has been compiled which describes the comprehensive, evidence-based program and the individual components in more detail.

Individualized Widex Zen Therapy

Different tinnitus patients may require different components of Widex Zen Therapy. Thus tinnitus patients with minimal or no negative reaction may be helped adequately with simple counseling and education. Others may require counseling and amplification, while patients whose reaction to the tinnitus is severe and negative will require an integrated program incorporating all Widex Zen Therapy components.

The ultimate decision on how to design Widex Zen Therapy for a given individual should be based on the information gleaned from the Widex Zen Therapy Intake Questionnaire, personal interviews with the patient, and the use of one or more subjective tinnitus scales. A general guideline on how to determine which components to incorporate for a given individual is provided in the Widex Zen Therapy manual.

When fitting the Zen programs for Widex Zen Therapy, a basic fitting which fulfills the needs of most patients is recommended. The basic fitting incorporates:

- a. Zen Aqua + mic for all-day sound stimulation
- b. Zen Aqua + noise + mic for all-day sound stimulation in periods where tinnitus is more bothersome
- c. Zen noise + mic, which might be found effective in reducing tinnitus awareness early in therapy.

For the more complex patient, or for the practitioner who specializes in tinnitus, the manual also contains a flexible protocol for the Advanced Widex Zen Therapy Fitting.

Finally, the manual helps the hearing health care professional to establish realistic, time-based expectations, provide methods of assessing progress, and create a follow-up schedule. In addition, the information is demonstrated with the use of case examples.

Summary:

Widex Zen Therapy is designed to provide professionals with a comprehensive, evidence-based program consisting of amplification devices with flexible sound-based tools, along with an extensive counseling and relaxation program. A specific protocol has been established that will provide the hearing health care professional who does not have time to provide extensive therapy with a basic, straightforward fitting strategy and counseling materials, as well as advanced fitting and counseling techniques for the professional who wishes to become a tinnitus expert.

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