

Tensor Tympani Syndrome

<http://www.hyperacusis.net/hyperacusis/tensor+tympani+syndrome/default.asp>

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Hyperacusis is an abnormal intolerance to ordinary, everyday sounds, which may develop in association with tinnitus related distress. Decreased sound tolerance is a general term covering hyperacusis, misophonia and phonophobia. Misophonia is a strong dislike of sound and is widespread - almost everyone has a sound they have disliked at some time. Phonophobia is a specific case of misophonia where people fear being exposed to a certain sound, often in the belief that it will damage the ear; make their tinnitus/hyperacusis worse; lead to uncontrollably high levels of anxiety. Phonophobia may develop in association with hyperacusis and tinnitus. Symptoms can range from mild through to severe to extreme.

Pre-existing tinnitus, misophonia and high levels of anxiety/depression are factors that can predispose towards the development of decreased sound tolerance. Hyperacusis may develop with a number of conditions affecting the auditory pathway (including acoustic shock injury, Meniere's Disease, otosclerosis, perilymph fistula, Bell's Palsy), psychiatric disorders, neurological injuries and disorders (including head injury, migraine), adverse reactions to some medications, autistic spectrum disorders, Lyme Disease, chronic fatigue syndrome and fibromyalgia.

There is little specific data about the frequency of hyperacusis in the general population. Estimates are affected by the way hyperacusis is defined and opinions range widely. Hyperacusis is less common than tinnitus, with tinnitus severely affecting 2% of the population.

When hyperacusis develops, everyday sounds appear unnaturally prominent and increasingly louder. Following exposure to some or many of these sounds, a temporary increase in tinnitus (if present) and/or hyperacusis may be noticed, and escalating sensations in the ear may develop, such as ear pain, a fluttering sensation or an intermittent fullness. This reaction can generalize to include more and more sounds. As a result, people may come to believe that their ears are no longer able to physically tolerate these sounds and/or that these sounds are causing damage to their ears or hearing and that they should be avoided. The escalating anxiety about the effects of exposure to these sounds can lead to the development of misophonia and phonophobia. People with decreased sound tolerance often feel the need to regularly and sometimes constantly monitor their auditory environment to protect their ears and sense of hearing. As a result hypervigilance of the acoustic environment

can develop. Frequent monitoring of the ear symptoms described above is common.

People with significant hyperacusis generally don't tolerate any loud sounds, many moderate volume sounds, particularly if sudden and unexpected, and some soft sounds. High frequency sounds tend to be tolerated less well. This can have a major impact on their lives, limiting their horizons and creating high levels of anxiety. Explaining such an abnormal reaction to sound to other people, including at times health professionals, is difficult and people with decreased sound tolerance often feel misunderstood, isolated and accused of malingering.

A detailed description of the peripheral (the outer, middle and inner ear) and central (the brain) auditory pathway is essential to understand how hyperacusis develops.

In the middle ear, the tensor tympani muscle and the stapedial muscle contract to tighten the middle ear bones (the ossicles) as a reaction to loud, potentially damaging sound. This provides protection to the inner ear from these loud sounds.

In many people with hyperacusis, an increased activity develops in the tensor tympani muscle in the middle ear as part of the startle response to some sounds. This lowered reflex threshold for tensor tympani contraction is activated by the perception/anticipation of loud sound, and is called tonic **tensor tympani syndrome (TTTS)**. In some people with hyperacusis, the tensor tympani muscle can contract just by thinking about a loud sound. Following exposure to intolerable sounds, this contraction of the tensor tympani muscle tightens the ear drum, which can lead to the symptoms of ear pain/a fluttering sensation/a sensation of fullness in the ear (in the absence of any middle or inner ear pathology).

It does not harm the ear to experience TTTS, and even though the TTTS symptoms can seem as if the ear is being damaged by some sounds, this is not the case. Moderate, everyday sounds are quite safe and do not harm the ear or cause a hearing loss.

As part of the processing of sound in the brain, all sounds are evaluated subconsciously with regard to their meaning or importance to us. Sounds that are considered important (in either a positive or negative way) will be transmitted to the more conscious parts of our brain, while unimportant sounds remain "half heard". If the sound acquires a negative association, the limbic system becomes activated, inducing fear or irritation. The autonomic nervous system also becomes activated, provoking the "fight or flight" reaction. A subconscious classical conditioned reflex develops so that repetition of this sound enhances the activation of the limbic and autonomic systems. In people with significant hyperacusis, many sounds are evaluated in the subconscious as potentially threatening. This same mechanism occurs when people react negatively to their tinnitus sounds.

Our brain is a highly plastic organ, constantly reorganizing and developing new neural connections. This means that we are able to

retrain our brain to reverse the process which has led to tinnitus distress and hyperacusis. The aim of hyperacusis/phonophobia management therapy is to provide information, counseling and a desensitization program, based on Tinnitus Retraining Therapy* principles, to increase tolerance to everyday sound.

Once the mechanism of hyperacusis has been understood, practical self-management strategies to assist desensitization and reduce auditory hypervigilance, personalized to suit each person's individual coping style, can be developed. Sound enrichment and low level sound therapy are required as part of the desensitization process. This may involve the fitting of wearable sound generators providing low volume neutral sound. Phonophobia management strategies need to be individually developed and usually involve a graded increase in listening to pleasant, relaxing sounds. Habituation to tinnitus and desensitization to intolerable external sounds is a gradual process, where the situations previously uncomfortable will become gradually less so. If hyperacusis and tinnitus are present, the hyperacusis is usually addressed first. Frequently, as the hyperacusis becomes more under control, the tinnitus becomes less of an issue.