Sound Intolerance: Hyperacusis and Misophonia

Hyperacusis is defined as an abnormal intolerance, heightened sense of volume and physical discomfort towards certain sounds, which other people can tolerate comfortably. Sounds that are typically difficult to tolerate are loud/impact/sustained sounds, particularly if they are unexpected or in close proximity. From my experience as a hyperacusis clinician for 20+ years, I consider that hyperacusis originates in many cases as an involuntary “protective” reaction. This can develop from a subconscious sense of threat that those sounds will exacerbate pre-existing aural symptoms such as tinnitus, hearing loss or are potentially damaging.

Misophonia is defined as a strongly aversive response to certain specific sounds, irrespective of their volume and often made by other people eg: the sounds of other people eating/breathing/swallowing, dogs barking, noise from a nearby factory etc. It may develop when those sounds become perceived as an intolerable intrusion into one’s sense of personal space.

While hyperacusis and misophonia can occur concurrently, the nature of the threat from these sounds is different so they are separate conditions. Both conditions have the potential to escalate, so that an increasing range of sounds become intolerable.

What can cause hyperacusis?
Pre-existing tinnitus, misophonia and high levels of anxiety are factors that can predispose towards the development of hyperacusis. Hyperacusis can develop with a number of conditions affecting the auditory pathway: exposure to a sudden/unexpected/loud/traumatic sound may lead to hyperacusis from acoustic shock (AS); recruitment (‘rate of growth’ of loudness distortion) from a sensorineural hearing loss; auditory processing disorders; Meniere’s Disease; otosclerosis; perilymph fistula; Bell’s Palsy. Hyperacusis can develop with psychiatric disorders, neurological injuries and disorders (including head injury, migraine), adverse reactions to some medications, autistic spectrum disorders, chronic fatigue syndrome, fibromyalgia and Lyme Disease.

How common is hyperacusis?
©Dineen & Westcott Audiology Pty Ltd
74 Mount Street, Heidelberg, Victoria, Australia 3084
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. The consensus among tinnitus clinicians is that about 40% of those severely affected by tinnitus develop hyperacusis. My research, supported by research from Germany, indicates this figure may be higher – with about 50% of those severely affected by tinnitus diagnosed as having developed hyperacusis.

How common is misophonia?
Misophonia is a relatively recently identified condition, with no prevalence data currently available. Online forums in the last few years have raised awareness, suggesting misophonia is more widespread than has previously been acknowledged.

How does hyperacusis develop?
When hyperacusis develops, everyday sounds begin to 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 generalise 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 should be avoided. The escalating anxiety about the effects of exposure to these sounds can lead to an escalation in hyperacusis.

How does misophonia develop?
When misophonia develops, everyday sounds begin to appear unnaturally prominent and increasingly annoying. Following exposure to some or many of these sounds, high levels of irritability, anger and disgust can occur. This reaction can generalise to include more and more sounds. The escalating anxiety about the emotional reaction following exposure to these sounds can lead to an escalation in misophonia. Those affected can feel overwhelmed or embarrassed by the intensity of these emotions, and fear their ability to control them.

How do hyperacusis and misophonia affect people?
Hyperacusis and misophonia can range from mild to severe to extreme.

People with significant hyperacusis generally don’t tolerate any loud sounds, many moderate volume sounds, particularly if sudden and unexpected, and may not tolerate some soft sounds. High frequency and bass sounds tend to be tolerated less well. Avoidance of intolerable sounds can have a major impact on the lives of people with significant hyperacusis and misophonia, severely limiting their horizons and creating high levels of anticipatory anxiety.
People with hyperacusis and/or misophonia often feel the need to regularly and sometimes constantly monitor their auditory environment to avoid intolerable sounds. With hyperacusis, they may feel a need to protect their ears and sense of hearing from exposure to these sounds. In both conditions, they are likely to want to limit the high levels of emotional reaction they feel following exposure. As a result hypervigilance of the acoustic environment is common, leading to cognitive distraction and reduced concentration. Frequent monitoring of the ear symptoms developing with hyperacusis is common.

There is very little understanding of hyperacusis and/or misophonia in the community. Hyperacusis, misophonia and any physical symptoms in and around the ear following exposure to intolerable sounds are involuntary and subjective. The unusual cluster of these symptoms is readily misunderstood or not believed. Explaining such an abnormal reaction to sound to other people, including at times health professionals, is difficult and clients with hyperacusis and/or misophonia often feel misunderstood, isolated or trivialised.

Proposed mechanism of hyperacusis

P Jastreboff’s neurophysiological model of tinnitus and hyperacusis:
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 a sound acquires a negative association, the limbic system in the brain becomes activated, inducing fear or irritation. The autonomic nervous system also becomes activated, provoking the “fight or flight” reaction. A conditioned response develops so that repetition of this sound enhances the activation of the limbic and autonomic systems. In people with significant hyperacusis/misophonia, many sounds are evaluated in the subconscious as potentially threatening, because of physical discomfort and difficulty controlling the emotional reaction experienced following exposure.

Our brain is a highly plastic organ, constantly reorganising and developing new neural connections. This means that we are able to retrain our brain to reverse the process which has led to hyperacusis and tinnitus distress.

Tonic Tensor Tympani Syndrome (TTTS)
In the middle ear, the tensor tympani muscle and the stapedial muscle will contract as a reaction to loud, potentially damaging sounds. This dampens the conduction of these sounds along the middle ear bones (the ossicles) to the inner ear, providing protection to the inner ear.

In many people with hyperacusis, an increased, involuntary activity can develop in the tensor tympani muscle in the middle ear as part of a protective and startle
response to sounds perceived as threatening. This lowered reflex threshold for tensor tympani contraction appears to be activated by the perception/anticipation of sudden, unexpected, loud sound, and is called tonic tensor tympani syndrome (TTTS). This can generalise in response to other types of sound and to lower sound volume levels. In some people with hyperacusis, it appears that the tensor tympani muscle can contract just by thinking about a loud sound. TTTS typically does not develop in those with misophonia.

Following exposure to intolerable sounds, this heightened contraction of the tensor tympani muscle may:

- affect the opening of the Eustachian tube, which ventilates the middle ear cavity, and is normally closed but opens when we yawn or swallow
- tighten the ear drum
- stiffen the middle ear bones (ossicles)
- lead to irritability of the trigeminal nerve

As a result, TTTS can cause a range of symptoms in and around the ear(s). These include ear pain, pain in the jaw joint and down the neck, the development of tinnitus or an increase/change in pre-existing tinnitus, a fluttering sensation in the ear, a sensation of blockage or fullness in the ear, unsteadiness, muffled hearing.

Jaw joint dysfunction can result in TTTS, and TTTS-like symptoms may be due to middle or inner ear pathology. Medical investigation should be carried out to exclude these possibilities. Conversely, TTTS symptoms in hyperacusis patients can be readily mistaken for middle, inner ear or jaw joint pathology.

For some people with severe TTTS, hyperacusis or Acoustic Shock Disorder, trigeminal nerve irritability from TTTS can lead to persistent pain. This may be in the form of a dull ache in and around the ear or a sharp stabbing aural pain, developing or increasing following exposure to intolerable sounds. Central pain sensitisation can develop from this chronic pain, as indicated by the development of muscle trigger points in the neck, shoulder and arm in these patients.

TTTS-induced symptoms of numbness/burning in and around the ear is also consistent with trigeminal nerve irritation. Referral to a Pain Specialist or Neurologist is recommended for those patients with chronic trigeminal neuralgic pain. Medication for nerve pain is generally required, eg: Endep or Lyrica (Pregabalin).

A musculo-skeletal physiotherapist can provide exercises to relax the facial muscles in and around the ear and guidance in locating muscle trigger points in the neck, shoulder and arm. Patients carrying out these exercises plus gentle self-massage of their trigger points report benefit in reducing the intensity of their pain and in managing flare-ups. In some hyperacusis patients, this can also reduce hyperacusis severity.
The development of TTTS symptoms after exposure to everyday sounds that are difficult to tolerate can seem as if the ear is being damaged by those sounds - but this is not the case. Moderate, everyday sounds are safe and do not harm the ear or cause a hearing loss.

It is important for people with hyperacusis to understand and accept the neurophysiological basis of TTTS, which is responsible for many of the physical sensations experienced in their ears after exposure to an intolerable sound. As TTTS develops from the way intolerable sound is perceived in the brain, using strategies aiming for hyperacusis desensitisation will reduce TTTS symptoms.

The nerves and muscles in and around the ears are complex and interconnected, and we don’t yet understand how they may be contributing to TTTS symptoms. Surgery to plug the oval and round windows of the inner ear is currently being offered as a hyperacusis treatment but is not widely available and can result in a hearing loss. Surgical cutting of the tensor tympani muscle is a last resort. Surgery for TTTS has not been scientifically researched with regards to effectiveness in reducing or eliminating TTTS-induced symptoms. If surgery is available, in my opinion it should only be considered after hyperacusis desensitisation therapy has been carried out.

How to achieve hyperacusis desensitisation
Complete desensitisation may be difficult to achieve and an unrealistic expectation. However, partial desensitisation can make a big difference to the emotional impact and lifestyle constraints of hyperacusis/misophonia.

- identify how and why sounds changed from being tolerable to intolerable, so the process can be unravelled.
- try not to judge or blame yourself (or others) for developing hyperacusis/misophonia –it develops in our subconscious as a mostly involuntary process. However, if your sound intolerance is causing unwanted restrictions in your life and you want to achieve desensitisation, you need to acknowledge and accept it as an ‘abnormal’ reaction which you want to change.
- challenge maladaptive and catastrophic thoughts and beliefs, which can exacerbate your hyperacusis/misophonia, by accepting and understanding the way the brain highlights some sounds. Examples of maladaptive beliefs include “my ears must be more sensitive than other people’s because I can hear these sounds more strongly “; “intolerable sounds hurt/increase my tinnitus so they must be damaging my ears”; “my ears must be more sensitive than other people’s because I’ve got tinnitus/noise damage already””; “I can’t lead a normal life because I have to avoid noisy places/music”.
- Hypervigilance to intolerable sounds enhances and perpetuates the brain’s interpretation of these sounds as threatening. Use distraction strategies to
reduce vigilance. This is difficult and might seem counter-intuitive, but is essential.

- Excessive monitoring of TTTS symptoms enhances their annoyance. Try to limit or avoid this, after making sure there is no underlying pathology and getting effective treatment for symptoms of frequent pain, as described above.

- Learn to recognise and control the emotional reaction you experience following exposure to an intolerable sound eg panic, anxiety, distress, anger, intrusion, invasion of “my” space.

- Sound enrichment strategies: An intolerable sound is less obvious in the presence of another sound. The aim is to surround (not mask) the intolerable sound with a neutral sound, which you can select and control, and is easily ignored. An i-pod can be helpful, using headphones around the neck so you are able to hear the sound while remaining open to communication.

- Create a “safe space” where sound enrichment strategies can be used to create a shield or barrier to intolerable sounds.

- Gradually expand your ‘comfort’ zone, using ear protection only if you are feeling highly threatened.

- Be patient, persistent and pro-active - hyperacusis desensitisation takes time, so do not expect quick changes.