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Turn Off the Ringing Sound

Researchers Explore New Treatments to Silence the Persistent Din of Tinnitus

By MELINDA BECK



Some people hear a high-pitched buzzing sound. Others describe it as a ringing, roaring, hissing, chirping, whooshing or wheezing. It can be high or low, single or multi-toned, an occasional mild annoyance or a constant personal din.

Tinnitus—whose Latin root means "to jingle"—is defined as the perception of sound when no external sound is present. It usually accompanies hearing loss, and while no one knows for sure what causes it, many experts believe that when people lose the ability to hear in certain frequencies, the brain fills the void with imaginary or remembered noise—like phantom limb pain for sound.

"Those auditory centers are just craving input," says Rebecca Price, an audiologist who treats tinnitus at Duke University Health Systems in Durham, N.C.

Tuning Out

A gadget designed to help patients filter out tinnitus.

The Oasis device from Neuromonics Inc. plays baroque and new-age music customized to provide auditory stimulation in patients' lost frequencies as well as a 'shower' sound. Users listen to the program for two hours daily for two months, then the shower sound is withdrawn for four more months of treatment, gradually training the brain to filter out the internal noise, the company says.

Some 50 million Americans at least occasionally experience tinnitus, pronounced tin-EYE-tus or TIN-i-tus. And 16 million U.S. adults had it frequently in the past year, according to a new study by the Centers for Disease Control and Prevention. Some two million find it so disturbing that it interferes with sleep, work, concentration and family relationships.

The incidence is rising these days along with the aging population and personal music players cranked up high. "Now we have 12-year-olds

complaining of tinnitus. We never had that previously," says Jennifer Born, a spokeswoman for the [American Tinnitus Association](#), a nonprofit education and advocacy group.

Tinnitus is also the No. 1 service-related disability among veterans from Afghanistan and Iraq, due to brain injuries from explosive devices.

While many sufferers are told there is no cure for their tinnitus, treatment options are proliferating. And brain-imaging studies are shedding new light on how some peoples' brains are wired with unusual connections between the auditory cortex that governs hearing and the centers for attention, emotion and executive function.

"We have always wondered why some people find tinnitus so distressing. Now we can see it," says Jay Piccirillo, an otolaryngologist at Washington University in St. Louis who is studying a new treatment for tinnitus that targets magnetic pulses at patients' brains to redirect abnormal connections.

The first step in treating tinnitus is usually to determine if a patient has hearing loss and to identify the cause, which can run the gamut from ear-wax buildup to infections, accidents, aging, medication side effects and noise exposure.

"At least half of the time, if we can reduce the hearing loss, we can dramatically reduce the tinnitus or make it so that the patient doesn't care," says Sujana Chandrasekhar, an otolaryngologist in New York and chairman-elect of the American Academy of Otolaryngology-Head and Neck Surgery.

Tinnitus Reaction Questionnaire

3. My tinnitus has made me feel irritable.

- Not at all
 A little of the time
 Some of the time
 A good deal of the time
 Almost all of the time

Surgery may be helpful in some cases. Frank Scalera, a 42-year-old pipefitter in New York, had tinnitus ever since a firecracker blew out his eardrum at age 15. Ten surgeries have helped restore his hearing and reduce the ringing he's heard for 30 years.

About 40% of tinnitus sufferers find relief with a regular hearing aid that restores sound in lost frequencies, so the brain doesn't need to fill in the void. But some also have hyperacusis—in which normal sounds seem unbearably loud—so a hearing aid may be uncomfortable.

A variety of tinnitus treatments use sound therapy—soothing external sounds to drown out the ringing from within. Some people find relief by running a fan, a humidifier, a machine that mimics waves or waterfalls or even a radio tuned to static, especially at night when tinnitus is often most noticeable and frequently disrupts sleep.

Videos: More on Health

- [Tips to Prevent Kids' Hearing Loss](#)
- [Brain Scan Reveals Source of Anxiety](#)
- [Paralysis Research Focuses on Mind Over Matter](#)

Several brands of hearing aids also mix in soft "shhhssing" tones to mask tinnitus sounds and help users relax. As with other hearing aids, they are rarely covered by insurance and can cost \$2,500 or more per ear.

Another variation is the Oasis device by Neuromonics Inc., which looks like an MP3 player but plays baroque and new age music customized to provide more auditory stimulation in patients' lost frequencies as well as a "shower" sound to relieve the tinnitus. Users listen to the program for two hours daily for two months, then the shower sound is withdrawn for four more months of treatment, gradually training the brain to filter out the internal noise, according to the company.

"You get used to hearing the music and then your brain fills in with sounds that aren't as irritating," explains Michael Gillespie, a Duke University political science professor who found the device helpful after an ear infection left him with tinnitus.

Dr. Price says she has used Neuromonics treatment with 30 patients, and 90% have had at least a partial reduction in their tinnitus awareness, similar to the company's published data.

Cleared by the Food and Drug Administration in 2005, the Neuromonics device has been used by 4,500 patients in the U.S., Australia, New Zealand and Singapore. The cost—roughly \$4,500—is rarely covered by insurance.

For some patients, it's not the noise itself that's so distressing, but the anxiety that comes along with it. Researchers long theorized—and have now seen on brain scans—that the limbic system, the brain's primitive fight-or-flight response, is highly activated in some tinnitus sufferers. Patients often have generalized anxiety disorder or depression and a few become suicidal; but it's unclear which came first.

Some patients find that antidepressants or anti-anxiety drugs can bring some tinnitus relief. Many find their tinnitus is worse during times of stress, so yoga, acupuncture, deep breathing, biofeedback or exercise—may also be helpful.

Ginkgo, zinc, magnesium and other supplements are often marketed for tinnitus relief, along with a bevy of over-the-counter products, but few have been evaluated scientifically. "There are a lot of people out there trying to capitalize on the desperation of tinnitus patients," Ms. Born says.



The Oasis.

Neuromonics Inc.

The new magnetic pulse treatment—called repetitive Transcranial Magnetic Stimulation (rTMS)—seeks to break the tinnitus cycle in a different way. Researchers first conduct scans of patients' brains. In people with severe tinnitus, "We notice that communication between parts of the brain responsible for hearing and maintaining attention are abnormal," says Dr. Piccirillo. A magnetic coil placed over auditory cortex outside the head sends pulses through the skull and attempts to disrupt the faulty communications. Dr. Piccirillo likens it to shaking an Etch-a-Sketch to erase an old picture. "We hypothesize that given half a chance, the brain can establish more normal connections," he says.

rTMS has been used for years with severely depressed patients, some of whom found that it also stopped the ringing in their ears. To patients, it feels like a mild tapping on the head and brings no harmful effects. One early study found that it had little benefit either compared to a placebo when used for 40 minutes, five times a week for two weeks. Dr. Piccirillo and colleagues are now studying whether using four-week rTMS sessions and higher energy is more effective. With a Defense Department grant, they

are also scanning the brains of U.S. soldiers before and after deployment to see if those who develop tinnitus had unusual brain wiring that made them especially vulnerable.

One of the most effective treatments is cognitive behavioral therapy, which treats patients' emotional reactions to tinnitus, not the noise itself. "The goal is to make your tinnitus like your socks and shoes—you're wearing them, but you're not actively thinking about them," says Dr. Chandrasekhar.

Michelle Pearce, a psychologist at Duke University Medical Center, says she starts by getting patients to identify the automatic negative thoughts they have about their tinnitus. "Some patients say things like, 'My life is over now.' I had one who was convinced no one would want to marry her because of her tinnitus," says Dr. Pearce. "Our work together was to realize that her life didn't resolve around tinnitus; it was just part of her life."

Indeed, some patients say learning to ignore the sound in their head is ultimately the most effective thing to do.

"It's like living near an airport. After you've lived there for awhile, you don't pay attention to the planes," says Mark Church, an entrepreneur and investor who has tried multiple treatments for tinnitus that started 11 years ago. Still, he says, his favorite place is his shower, where he can't hear it at all.

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Tinnitus

is the perception of sound in one or both ears or in the head when no external sound is present. It can be single or multi-toned; constant or intermittent; temporary or life-long.

Causes

- Hearing loss—due to aging, exposure to loud noise, accidents, illnesses, auditory nerve tumors, wax buildup and some drug side effects
- History of ear infections
- Brain injuries from explosive devices
- Head and neck trauma
- Temporomandibular joint disorder (TMJ)
- Hormonal imbalances

Treatments

- Hearing aids—with or without masking sounds
- Surgery to repair damaged tissue
- Antibiotics and other drugs to combat illnesses
- Fan, humidifier or sound machines
- Customized music player
- Cognitive behavioral therapy
- Anti-anxiety drugs or antidepressants

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