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CAN'T GET IT OUT OF MY HEAD: BRAIN DISORDER CAUSES MYSTERIOUS MUSIC HALLUCINATIONS

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Janet Dilbeck clearly remembers the moment the music started. Two years ago she was lying in bed on the California ranch where she and her husband were caretakers. A mild earthquake woke her up. To Californians, a mild earthquake is about as unusual as a hailstorm, so Dilbeck tried to go back to sleep once it ended. But just then she heard a melody playing on an organ, "very loud, but not deafening," as she recalls. Dilbeck recognized the tune, a sad old song called When You and I Were Young, Maggie.

Maggie was her mother's name, and when Dilbeck (now 70) was a girl her father would jokingly play the song on their home organ. Dilbeck is no believer in ghosts, but as she sat up in bed listening to the song, she couldn't help but ask, "Is that you, Daddy?"

She got no answer, but the song went on, clear and loud. It began again from the beginning, and continued to repeat itself for hours. "I thought, this is too strange," Dilbeck says. She tried to get back to sleep, but thanks to the music she could only doze off and on. When she got up at dawn, the song continued. In the months to come, Dilbeck would hear other songs. She heard merry-go-round calliopes and Silent Night. For a few weeks, it was The Star-Spangled Banner.

The music often began when she lay down for a nap, or when she drove her car, and would last for hours. Like most people, Dilbeck knew what it was like to have a song stuck in her head, but this was different. The music sounded as vivid as that coming out of a radio or an orchestra pit. The only way she could make the music stop, she found, was to play the radio. "Fight fire with fire," she thought.

For the most part, Dilbeck kept her perplexing condition to herself. And the melodies were more than just annoying; they had a strangely sinister quality. Once she began to hear a song -- even if it was one of her favourite pieces by Chopin -- she could no longer bear to listen to a real version of it.

Dilbeck endured this mystifying condition on her own for months, until she paid a visit to a San Francisco doctor. She had come to see him about her Lyme disease, which had plagued her since 1993. As they reviewed her symptoms, she told him about the songs. Her doctor informed her that she had a little-known medical condition called musical hallucinosis. She belonged to a small but significant number of people who heard music that simply wasn't there.

Dilbeck's experience is typical -- if not universal -- among people who have musical hallucinations. Many sufferers are elderly and the songs often emerge from the deepest recesses of memory. One patient heard Italian opera that her parents used to listen to. Others hear hymns, sea shanties, jazz or pop tunes.

And while some people get used to the music and even enjoy it, to most people it is alarming and disorienting. Sufferers try to stop the sounds by closing the windows in their house, blocking up the chimney, stuffing cotton wool in their ears or sleeping with a pillow over their head.

"It's not a joke at all," says Timothy Griffiths, an expert on auditory disorders at the Newcastle University Medical School in England. "It's distracting and horrid."

Musical hallucinations were invading people's minds long before they were recognized as a medical condition. "Robert Schumann hallucinated music toward the end of his life and wrote it down," says Diana Deutsch, a psychology professor at the University of California, San Diego. "He said he was taking dictation from Schubert's ghost."

The biggest survey of musical hallucinations to date was carried out at a Japanese psychiatric hospital in 1998. There, researchers found that six out of 3,678 patients had the condition. This one-in-600 figure is unlikely to reflect the prominence of the condition, however, because the doctors only looked at people with serious psychiatric disorders.

In fact, people who are otherwise of sound mind also experience musical hallucinations. Other studies have linked musical hallucinations to a range of things including old age, deafness, brain tumours, drug overdoses and even liver transplants. And it is thought that many people who have musical hallucinations may keep the condition to themselves.

"My suspicion is that there are people who have it who don't come forward; they can be a little embarrassed about it," Griffiths says.

Despite these confusing patterns, one thing is clear: Musical hallucinations shouldn't just be lumped in with other hallucinations, such as hearing voices or seeing visions.

A person can hear musical hallucinations every hour of the day without any other distortion of reality. That's because our brains process music, neuroscientists have discovered, through a unique network of neurons. When sounds first enter our brains they activate a region near the ears called the primary auditory cortex that starts processing sounds at their most basic level. The auditory cortex then passes on signals of its own to other regions, which can recognize more complex features of music, such as rhythm, key changes and melody.

Research has shown that these neurons can go wrong without affecting any other part of the brain. Some people who have suffered brain damage lose the faculty of music while remaining otherwise normal. Other patients cannot recognize or remember musical tunes. Others can't tap time to music.

Griffiths has taken this research further. He studied six elderly patients who developed musical hallucinations after they began to go deaf. The music they heard ranged from rugby songs to the hits of British singer Shirley Bassey. Griffiths scanned his subjects' brains with a technique known as PET (positron emission tomography). He injected a radioactive marker into their bloodstream, which accumulated in the most active parts of the brains of his subjects. Each time he scanned his subjects' brains, he asked them whether they had experienced a musical hallucination during the scan. If they had, he asked them to rate its intensity on a scale from one

to seven.

Griffiths discovered a network of regions in the brain that became more active as the hallucinations got more intense. He was taken aback by their pattern. "You see a very similar pattern in normal people who are listening to music," he says. The main difference is that musical hallucinations don't activate the primary auditory cortex, the first stop for sound in the brain. When people hallucinate, they use only the parts of the brain responsible for turning simple sounds into complex music.

Griffiths has used these results to build a hypothesis: The music-processing regions of the brain are continually looking for patterns in the signals arriving from the ears. As these regions recognize a tune, they amplify certain sounds that fit the music and minimize extraneous sounds. That's how you can hear the melody of a piano in a noisy lounge. When no sound is coming into the ears, Griffiths argues, neurons in the music network sometimes spontaneously fire off random impulses. The brain can seize on these signals and try to impose some structure to them, rummaging through its memories for a match. A few notes may suddenly turn into a familiar melody. For most of us, these signals may only produce a song that is hard to get out of our head, and with a constant stream of information coming in from our ears, this false music is suppressed. But deafness cuts off this stream, and in a few people the music-seeking circuits go into overdrive. They hear music all the time --not just the vague murmurs of a stuck tune. It becomes as real as any normal perception.

"What we're seeing is an amplification of a normal mechanism that's in everyone," Griffiths says. "I'm really talking about that tune-in-your-head phenomenon, but it's so amplified in these people that it is abnormal."

This theory could explain why sufferers so often dredge up music heard early in life. These melodies may be the most strongly encoded in our memories and thus most easily summoned up by the music-perception network. But it will take much more research to explain the musical hallucinations of people such as Janet Dilbeck who are not deaf.

Diana Deutsch is planning new research. Unlike previous studies, she will scan her subjects with magnetic resonance imaging (MRI), which can catch second-by-second changes in brain activity. "It might be a while before we have results, but it's certainly something I'm very excited about," she says. "We'll see where it takes us."

Deutsch has had no trouble finding volunteers. That's probably because people suffering from musical hallucinosis are given little help within the medical community. "Doctors don't take it seriously, or put it down to tinnitus: a ringing in the ears," she says. "But you don't get the Battle Hymn of the Republic from ringing in the ears. Often these people don't get the sympathy and the care they should."

In some cases, doctors can treat musical hallucinations. Partially deaf people seem to get some relief by using better hearing aids, according to Griffiths, perhaps because they can then suppress their music circuits with outside sounds. Some research suggests infections of the brain, such as syphilis and Lyme disease, can trigger musical hallucinations by inflaming parts of the brain. Curing the diseases sometimes cures the hallucinations as well. And in other cases, the songs just stop. "People have written to me to say, 'A wonderful thing has happened; they've gone away,'" Deutsch says. "People need to have the hope that it's not going to remain with them forever."

But hope is a long way from a cure. When Dilbeck tried a new antibiotic for her Lyme disease the songs stopped, but the side effects of the drug were too much for her. Since she went off the antibiotic, the hallucinations have returned. For some reason they are milder now than before -- often just a few notes over and over again -- but they're still a burden. "I'm resigned to them," Dilbeck says. "But I'd give \$100,000 -- if I had it -- to make them go away."

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