LIFE & ARTS | HEALTH | HEALTH JOURNAL

Why You Can't Get That Song Out of Your Head

Scientists call intrusive musical fragments 'earworms' and think they may help solve mysteries of memory

By

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Ever had a song stuck in your head, playing on an endless loop?

Scientists call them "involuntary musical images," or "earworms," and a wave of new research is shining light on why they occur and what can be learned from them.

Some neuroscientists and cognitive psychologists are studying earworms to explore the mysteries of memory and the part of the brain that is beyond our conscious control.

"The idea that we have full control over our thought processes is an illusion," says psychologist Lauren Stewart, who founded the master's program in music, mind and brain at Goldsmiths, University of London, where recent research has taken place.

Researchers haven't been able to watch what happens in the brain when earworms occur, because they happen unpredictably. Much of what is known about them comes from surveys, questionnaires, diaries and lab experiments.

A Goldsmiths study published in the journal Memory and Cognition this year showed that the singing we hear in our heads tends to be true to actual recordings. Researchers had 17 volunteers tap to the beat of

HOW TO GET RID OF AN EARWORM

- Listen to the actual song—all the way to the end. 'Some people say that's the only way to achieve closure,' says Kelly Jakubowski, a Goldsmiths, University of London psychologist.
- Distract yourself with a task that requires attention.
- Imagine a different song to drown the first one. 'The Girl from Ipanema' has legendary earworm-chasing capacity. 'Five or six people in our studies mentioned "God Save the Queen",' says Dr. Jakubowski.
- Chew gum. In a study, the Quarterly Journal of Experimental Psychology in April, researchers at the University of Reading in England, 98 volunteers listened to 'Play Hard' by David Guetta and 'Payphone' by Maroon 5 and then hit a key if they heard either in their heads. Those who chewed gum reported one-third fewer earworms—possibly because the action ties up the same mental pathways used in imagining music, the researchers surmised.

any earworm they heard during a four-day period while recordings.

Another Goldsmiths study, published this year in Consciousness and Cognition, found that people who report hearing earworms often and find them most intrusive have slightly different brain structures, with more gray matter in areas associated with emotional processing.

Studies also show that the internal jukebox often starts playing during times of "low cognitive load," such as while showering, getting dressed, walking or doing chores. Dr. Stewart likens earworms to "sonic screen savers" that keep the mind entertained while it's otherwise idling.

She and her colleagues tested that theory by having volunteers listen to trailers from James Bond movies and "Pretty Woman" and giving them various tasks afterwards. The volunteers who sat idly for the next five minutes were the most likely to report hearing the music in their heads. "The more challenging the activity, they were less likely to hear the music," Dr. Stewart says.

The inner DJ doesn't cue up songs at random. Diary studies show songs tend to match people's moods. If you're feeling energized and upbeat, an earworm that occurs is likely to be up-tempo, too.

Songs the brain fixates on are usually those it has been exposed to recently, surveys show—which is why tunes getting heavy radio play

frequently top the earworm charts. Christmas songs turn up more during the holiday season, a 2011 study showed.

Even tunes you may have heard but didn't pay attention to can worm their way into your subconscious, says Ira Hyman, a psychologist at Western Washington University in Bellingham, Wash. In an unpublished study there, participants who listened to music while doing other tasks were more likely to report that the songs returned as earworms later on, compared with participants who simply listened at the time.

Words, images and other associations can summon up long-buried musical memories. The Goldsmiths researchers noted that survey respondents often cited Michael Jackson songs among their earworms when his physician was on trial in the U.S.

Some people find the mere mention of a song can set an earworm playing unstoppably. "My students and I play mean games with each other by humming bits of music," says Dr. Hyman. (Like, say, the theme song from "Gilligan's Island"? "Oh, that's really mean," he says.)

People who sing and listen to music more often tend to have longer, more-frequent earworms. And people with obsessive-compulsive tendencies are apt to have them more often and to find them more intrusive. Most earworms actually aren't unpleasant, surveys show. Yet even well-liked songs can become intrusive after repeated exposure.

Some earworms are just fragments of a song that repeat like a broken record. That may be because working memory holds only limited amounts of auditory information at one time, some experts say. Another possible explanation is that when the mind hits a part of a song it can't remember, it loops back rather than moving on.

That could make an earworm even more entrenched, Dr. Hyman says. According to a theory known as the Zeigarnik effect, named for a Soviet psychologist, Bluma Zeigarnik, unfinished thoughts and activities weigh on the mind more heavily than those that are completed, although experiments exposing students to interrupted songs have yielded mixed results.

Researchers say they can't pinpoint a spot in the brain where earworms live. Imaging studies by Andrea Halpern at Bucknell University, in Lewisburg, Pa., have shown that deliberately imagining music and actually listening to music activate many of the same neurological networks.

Dr. Halpern's earlier PET scan studies showed that when subjects

listened to the first few notes of familiar music, whether Beethoven's Fifth Symphony or the theme from "Dallas," and then were asked to imagine what came next, areas in the right frontal and superior temporal portions of the brain became activated, along with the supplementary motor area at the top, which is typically involved in remembering sequences. When the same subjects listened to unfamiliar music and were asked to recall it, there was activity in the left frontal portions of the brain instead.

One factor that makes some songs "sticky" might be repetition. "Repetition leads to familiarity which leads to anticipation, which is satisfied by hearing the song," say John Seabrook, author of "The Song Machine: Inside the Hit Factory," about how producers pump pop songs full of aural "hooks," the punchy melodic phrases designed to target the brain and leave it wanting more. A classic example: Taylor Swift's "Shake It Off." "It's like a sugar high," he says. "It pumps you up and just as you start coming down it gives you another hook."

Some scholars think earworms are highly individual. Out of more than 3,800 survey responses, researchers at Goldsmiths say only 506 songs were cited as earworms by more than one person. Lady Gaga's "Bad Romance" was mentioned by 33 respondents.

The researchers are comparing the melodic structure of 100 often-mentioned songs (Katy Perry's "California Girls," "Somebody That I Used to Know" by Gotye) with 100 similarly popular songs that weren't cited as earworms, to assess the differences.

Songs with earworm potential appear to share certain features: A repeating pattern of ups and downs in pitch, and an irregular musical interval. "It's like your brain picks up on that unusual element and wants to hear it again," says Kelly Jakubowski, one of the study authors.

The researchers plan next to test their results in reverse, and play ringtones from songs of both the earworm and non-earworm variety for volunteers several times a day to see which get stuck.

Drs. Stewart and Halpern are now working together to recruit survey participants for a study looking at whether people of different ages experience earworms differently. "You can argue that older people might get them more often because they know more songs," Dr. Halpern says. "But the few responses we have so far indicate that they have earworms less often. It could be that they don't play music as often as younger people do."

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Corrections & Amplifications

Taylor Swift's song "Shake It Off" was incorrectly called "Shake It Up" in an earlier version of this article. (Oct. 26, 2015)