

How Listening to Silence Changes Our Brains

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September 8, 2022 6:00 Am Edt

Source: <https://time.com/6210320/how-listening-to-silence-changes-our-brains/>

It's not just your imagination. The world is literally louder right now than it's been at any time in known history.

Even if COVID shelter-in-place orders brought a fleeting decline in decibel levels, the arc of modern life seems inescapable: more cars, helicopters, buzzing drones, pinging gadgets, ringing hospital monitors, blaring TVs in waiting rooms, and constant conversation in open-plan offices. Because emergency vehicles have to be loud enough to cut through the surrounding sounds, the decibels of their sirens are a useful measure of the loudness of our overall landscapes. Today's sirens are an estimated six times louder than they were a century ago, indicating that our population centers are vastly louder, too. According to the National Park Service's Natural Sounds and Night Skies Division, noise pollution doubles or triples every three decades.

Is all this noise just a nuisance?

Or, as we let silence slip away, are we sacrificing something important for our minds and bodies?

Across disciplines—from neuroscience to psychology to cardiology—there's growing consensus that noise is a serious threat to our health and cognition. And that silence is something truly vital—particularly for the brain.

"Noises cause stress, especially if we have little or no control over them," explains Mathias Basner, a professor at the University of Pennsylvania who specializes in sound processing and rest. "The body will excrete stress hormones like adrenaline and cortisol that lead to changes in the composition of our blood—and of our blood vessels, which

actually have been shown to be stiffer after a single night of noise exposure,” Basner says. When sound waves hit our eardrums, they vibrate the bones of the inner ear, causing ripples and waves in the fluids of a pea-sized, spiral-shaped cavity called the cochlea. Tiny hair-like structures inside the cochlea convert these movements into electrical signals which the auditory nerve transmits to the brain. Neuroscientists have found that these signals go to the amygdalae, the two almond-shaped clusters of neurons that form the primary biological basis of our emotional lives—including our fight-or-flight response. When signals hit the amygdalae, it starts the process through which we secrete stress hormones. Too many stimuli result in excessive stress—as evidenced by the presence of chemicals like cortisol in our blood.

In 1859, reflecting on her experiences with patients in a hospital during the Crimean War, the legendary British nurse and public health innovator Florence Nightingale wrote that: “Unnecessary noise, then, is the most cruel absence of care which can be inflicted either on sick or well.” The latest research demonstrates that she had an essential point.

For years, the concern has been that excessive noise can cause hearing loss—a grave issue that can also lead to social isolation and loneliness. But a broad set of peer-reviewed papers over the past few decades have shown risks that include cardiovascular disease, stroke, and depression, as well as the diverse complications that happen downstream of any of these.

In the 1970s, the pioneering environmental psychologist Arline Bronzaft found that the reading test scores of Manhattan middle schoolers whose classrooms faced a high-decibel elevated subway track lagged up to a year behind those of students in quieter classrooms on the opposite side of the building. Since the stress response to noise is well established, it was clear that intermittent spikes in decibel levels—almost on par with a heavy metal concert—were inherently problematic. But the issue was more than agitated amygdalae. The interference of the screeching trains probably broke students’ concentration, sending them off into their discursive thoughts, undermining their ability listen. External noise likely fed internal noise of mental chatter, damaging

attention, and, in turn, challenging cognition and memory.

While the costs of noise are increasingly clear, the power of silence for the mind and body is actually something bigger and deeper than the transcendence of stress or interruption.

Several years ago, Imke Kirste, then a professor at Duke University Medical School, led an unusual study to explore an ancient inquiry: “Is silence really golden?”

Kirste and her team put mice inside anechoic chambers—tiny virtually soundless booths—for two hours a day. Then they tested the effects on their brains of five types of sounds: white noise, mice pup sounds, Mozart’s “Sonata for Two Pianos in D,” ambient noise, and silence. Following the application of each sonic variable, her team measured cell growth in each mouse’s hippocampus—the region of the brain most associated with memory.

While Kirste and her team hypothesized that pup sounds would yield the strongest results, they found that silence, in fact, elicited the strongest response from the mice, yielding the highest number of newly grown and sustained neurons. “Functional imaging studies indicate that trying to hear in silence activates the auditory cortex,” they wrote.

It’s a simple but powerful notion: “trying to hear in silence” can demonstrably accelerate the growth of valuable brain cells. This act of listening to quiet can, in itself, enrich our capacity to think and perceive.

The idea is hardly new. “Learn to be silent,” the ancient polymath Pythagoras advised his students. The Greek philosopher and forerunner of modern geometry told his inner circle of pupils to: “Let your quiet mind listen and absorb the silence.” The 15th Century humanist John Reuchlin explained that Pythagoras saw the practice of being in silence as “the first rudiment of contemplation”—the prerequisite to all wisdom.

There’s also the millennia-old Indian tradition of Nada Yoga, sometimes known as “the yoga of sound.” Some teachers describe the practice as tuning-in to the “sound of silence.” Distinct from other meditation practices—which generally focus on watching the thoughts or noticing the breath—the instruction in Nada Yoga is to just listen. Simply

pay attention to the sounds around you, including the ringing in your own ears.

In Imke Kirste's analysis, the power of listening to silence isn't just pure relaxation. Counterintuitively, she and her colleagues noted that listening deeply in a quiet environment can actually be a kind of positive stress, called "eustress." Of the various stimuli they studied with the mice, they wrote, silence was "the most arousing, because it is highly atypical under wild conditions and must thus be perceived as alerting." While the study authors agree that most everyday stress undermines the growth and healing of the brain, they see eustress as something different—the kind of exertion that makes us grow beyond our limitations.

So, if you're able to take some time in silence, you don't necessarily need a sophisticated meditation practice to harness its benefits for health and cognition. Just listen. Simply take some time to tune in.

In an age of so much noise, silence deserves our attention.