



# Why Do Fingernails on a Chalkboard Make Us Cringe?

By Joseph Castro, Life's Little Mysteries Staff Writer  
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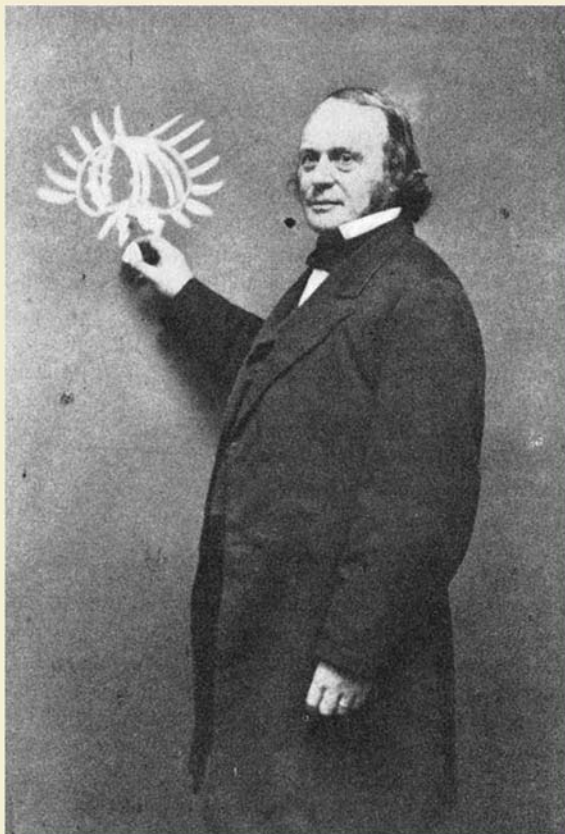


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If you're like most people, you probably can't stand the sound of fingernails scraping across a blackboard. In fact, you're probably cringing just thinking about it. But what is it about this ear-piercing noise and others like it that evokes such a visceral reaction?

A new study by musicologists in Europe suggests that the shape of our ear canals, as well as our own perceptions, is to blame for our distaste in such shrill sounds.

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The researchers, who presented their work on Nov. 3 at a meeting of the Acoustical Society of America, began their experiment by subjecting study participants to various unpleasant noises, such as a [saw blade being pulled through a log](#) and [a microscope squeaks](#). The participants rated their discomfort with each sound, allowing the researchers to identify the two worst sounds: [fingernails scratching on a chalkboard](#) and a piece of chalk running against slate.

They then created variations of these two sounds by modifying certain frequency ranges, removing the harmonic portions, or getting rid of the grating, noisy parts. They told half of the listeners the true source of the sounds, and the other half that the sounds came from pieces of contemporary music. Finally, they played back the new sounds for the participants, all the while monitoring certain indicators of stress, such as heart rate, blood pressure and the electrical conductivity of skin.

They found that the offensive sounds changed the listeners' skin conductivity significantly, showing that they really do cause a measurable, physical reaction. [[What Makes Music Enjoyable?](#)]

Interestingly, the most painful frequencies were not the highest or lowest, but instead were those that were between 2,000 and 4,000 Hz. The human ear is most sensitive to sounds that fall in this frequency range, said Michael Oehler, professor of media and music management at the University of Cologne in Germany, who was one of the researchers in the study.

Oehler points out that many acoustic features of [human speech](#), as well as the sound of a crying baby, fall in this frequency band, suggesting that the shape of our ear canal may have evolved to amplify frequencies that are important for communication. Having these frequencies amplified could have been advantageous for survival, allowing people to come to the rescue of their screaming infants quicker, and thus improve their offspring's chance of survival, or coordinate more effectively during a hunt. In this scenario, a painfully amplified chalkboard screech is just an unfortunate side effect of this (mostly) beneficial development. "But this is really just speculation," Oehler told Life's Little Mysteries. "The only thing we can definitively say is where we found the unpleasant frequencies."

Of course, this explanation might lead one to wonder why the ear canal doesn't amplify a larger range of human speech, which spans 150 to 7000 Hz. "I have no real explanation for it, but this would be a good subject for future research," Oehler said.

In any case, Oehler and his colleague Christoph Reuter of the University of Vienna found that our hatred of chalkboard screeches is not solely based in physiology; there are some psychological factors at work, too. Overall, the listeners in the study rated a sound as more pleasant if they thought it was pulled from a [musical composition](#) (though this didn't fool their bodies, as participants in both study groups expressed the same changes in skin conductivity). The implication, then, is that chalkboard screeches may not irk us so much if we didn't already think the sound is impossibly annoying.

We are now getting to the bottom of why we hate these sounds so much, but how does this help us? "Our findings might be useful for the sound design of everyday life," Oehler said. Engineers may someday be able to modify or mask those frequencies within factory machinery, vacuum cleaners or construction equipment, making the noises much easier to bear.

Now imagine that: construction noise that doesn't cause you to run for cover.

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