Why Fingernails on Blackboards Sound So Horrible

Categories: vacuum Cleaner

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Much time has been spent, over the past century, on working out exactly what it is about the sound of fingernails on a blackboard that's so unpleasant. A new study pins the blame on psychology and the design of our ear canals.

Previous research on the subject suggested that the sound is acoustically similar to the warning call of a primate, but that theory was debunked after monkeys responded to amplitude-matched white noise and other high-pitched sounds, whereas humans did not. Another study, in 1986, manipulated a recording of blackboard scraping and found that the medium-pitched frequencies are the source of the adverse reaction, rather than the the higher pitches (as previously thought). The work won author Randolph Blake an Ig Nobel Prize in 2006.

The latest study, conducted by musicologists Michael Oehler of the Macromedia University for Media and Communication in Cologne, Germany, and Christoph Reuter of the University of Vienna, looked at other sounds that generate a similar reaction — including chalk on slate, styrofoam squeaks, a plate being scraped by a fork, and the ol' fingernails on blackboard.

Some participants were told the genuine source of the sound, and others were told that the sounds were part of a contemporary music composition. Researchers asked the participants to rank which were the worst, and also monitored physical indicators of distress — heart rate, blood pressure and the electrical conductivity of skin.

They found that disturbing sounds do cause a measurable physical reaction, with skin conductivity changing significantly, and that the frequencies involved with unpleasant sounds also lie firmly within the range of human speech — between 2,000 and 4,000 Hz. Removing those frequencies from the sound made them much easier to listen to. But, interestingly, removing the noisy, scraping part of the sound made little difference.

A powerful psychological component was identified. If the listeners knew that the sound was fingernails on the chalkboard, they rated it as more unpleasant than if they were told it was from a musical composition. Even when they thought it was from music, however, their skin conductivity still changed consistently, suggesting that the physical part of the response remained.

That physical response is likely generated by the shape of the human ear canal, which prior research has shown to amplify frequencies in the range of 2,000 to 4,000 Hz. What seems to happen, the researchers reckon, is that when a screech on a chalkboard is generated, the sound is amplified within our ears to painful effect.

The next step for the researchers is to further explore the parameters of unpleasant noises, with the eventual goal of trying to mask those frequencies within factory machinery, vacuum cleaners or construction equipment. For the time being, though, it's probably best to steer clear of blackboards.

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See Also:

Tags: fingernails on blackboard, heart rate, ig nobel prize, physical indicators, styrofoam