

A study aims to pinpoint why we hate certain sounds

By Kim Krieger / *ScienceNOW*

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Some sounds are excruciating. Take fingernails squeaking on a chalkboard. The noise makes many people shudder, but researchers never knew exactly why. A new study finds that there are two factors at work: knowledge of where the sound comes from and the design of our ear canals.

Previous research found that the painful parts of unpleasant sounds appear to be in the middle range of audible frequencies. But scientists didn't nail down exactly which frequencies or explain why the sounds were painful. So musicologists Michael Oehler of the Macromedia University for Media and Communication in Cologne, Germany, and Christoph Reuter of the University of Vienna asked listeners to rank sounds in a listening test. Fingernails on a chalkboard and chalk squeaking against slate were the most unpleasant sounds from a family of recordings, which also included sounds such as Styrofoam squeaks and scraping a plate with a fork.

The researchers then modified the recordings of fingernails and chalk, removing or attenuating various frequency ranges. They also modified the sounds by selectively extracting either the tonal, musical-pitch parts or the scraping, growling, noiselike parts of the sound. Some listeners were told the true source of the sounds, whereas others were told that the sounds were part of contemporary musical compositions. The same listeners then rated the pleasantness or unpleasantness of the sounds while the researchers measured physical indicators of distress: the listeners' heart rate, blood pressure, and the electrical conductivity of their skin.

As they will report next week at the Acoustical Society of America conference in San Diego, Oehler and Reuter found that a listener's skin conductivity changed significantly when the person heard a sound he or she later reported as unpleasant, showing that disturbing sounds do cause a measurable physical reaction. Deleting the tonal parts of the sound entirely also made listeners perceive the sound as more pleasant, whereas removing other frequencies or the noisy, scraping parts of the sound made little difference.

The ratings also changed depending on what the listeners thought the sounds were. If they thought a sound came from a musical composition, they rated it as less unpleasant than if they knew it actually was fingernails on a chalkboard.

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