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FEATURES

Irritating Sounds

Ear anatomy may amplify obnoxious noise.

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The sound of fingernails on a chalkboard sets many people's teeth on edge, and now a team of researchers from the University of Cologne, in Germany, and the University of Vienna, in Austria, thinks it knows why. In a study designed to pinpoint the source of this and similarly irritating sounds, scientists found that the most obnoxious elements of the noises may be amplified by the shape of the human ear. The team presented its results at the annual meeting of the Acoustical Society of America (ASA) recently in San Diego.

The scientists removed information from actual audio clips of people scraping their nails or bits of chalk against a chalkboard. They then played these modified clips to willing participants. Half of the subjects were told what the sounds were, while the other half thought they were listening to selections from contemporary music. Scientists asked the participants to rate the unpleasantness of each sound and gauged their stress responses to the noises by measuring blood pressure, heart rate, and skin conductivity (a measure of sweating).

The human ear is known to be particularly sensitive to pitches in the mid- to low-level range of frequencies, between 2000 Hz and 4000 Hz. When scientists removed all the pitch information in this range from the audio recordings, the study participants rated the noises as more pleasant than other versions of the sounds.

One explanation for sensitivity to this band of frequencies is that sounds in this range are amplified due to the anatomy of the ear canal. They are literally louder to us than other sounds are. As a result, chalkboard squeaking may be irksome because the most obnoxious elements of the sound sit right in the "sweet spot" of human hearing.

The researchers supposed that frequencies in the low to mid range would play a major role in the unpleasantness of the sounds, "but we did not know the exact range," said Michael Oehler, PhD, professor of media and music management at the University of Cologne. "Furthermore, the influence of pitch information was greater than we thought."

Of potential interest to psychologists is the finding that participants who knew that the sounds they were hearing came from nails on a chalkboard rated these sounds more unpleasant and experienced a higher degree of sweating than the people who thought they were listening to music.

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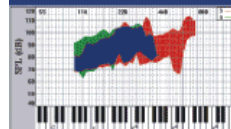
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