Research duo uncovers clues about why 'fingernails across a chalkboard' is so horrible

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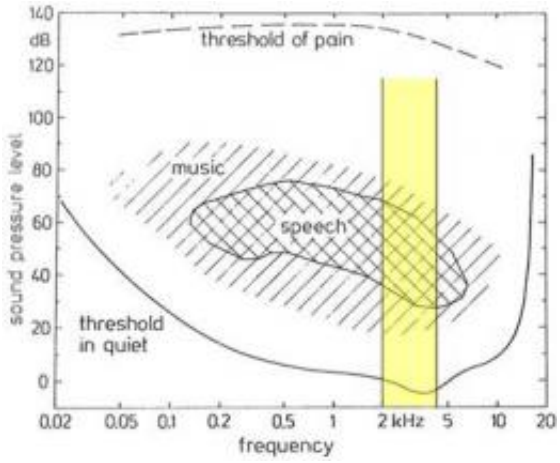

Hearing area between threshold in quiet an threshold of pain. Also indicated are the areas encompassed by music and speech and the area between 2000 Hz and 4000 Hz, where the human ear is most sensitive. The parts of the sounds in this frequency range were particularly important for the perceived unpleasantness (after Fastl & Zwicker, 2006, p. 17).

(Medical Xpress) -- Proving that science isn't always just fun and games, two researchers with music backgrounds have conducted experiments to get to the bottom of why people are so adversely effected by certain noises such as a fork dragged across a plate, Styrofoam squeaking or most famously, fingernails dragged across a chalk board. Christoph Reuter from the University of Vienna's Musicological Institute and

Michael Oehler of Macromedia University for Media and Communication in Germany, have managed to enlist volunteers to listen to such sounds while having their biological signs measured for reactions. They will be giving a presentation on their findings to the *Acoustical Society of America* today.

The two had 104 volunteers listen to recordings of various unpleasant sounds, 24 of them hooked up to devices that recorded their heart rate, blood pressure and galvanic skin response (a measure of skin conductance - not exactly a measure of the degree of skin crawling but perhaps close). The volunteers were all asked to rate their level of discomfort as each sound was played. The sounds played represented a wide frequency of sounds, some going as high as 12,000 hertz.

After analyzing the results the two found that the sounds that caused the most stress in the volunteers came from the 2,000 to 4,000 hertz range, which coincidence or not, is the same range as that produced by the human voice. This was somewhat expected as prior research by others had shown that people reacted more to the medium tones in chalkboard scraping than the high tones; that prior research had not narrowed the frequency range so clearly however.

As part of the experiment, the volunteers were given different explanations regarding the source of the sounds. Some were told a noise played was part of a musical composition, while others were told the truth, i.e. that it was in fact a recording of fingernails being dragged across a chalkboard, etc. Those that believed it was part of a musical composition rated the sounds as less unpleasant, though their bodies disagreed, showing just as much reaction as those that were told what the sounds really were.

In some instances, the researchers removed some parts of the recordings, such as the noisy scraping parts, before playing them for the volunteers,

but that appeared to have no discernible reduction in distress, which showed that it was the middle frequencies that caused the problem, not the rough scratchy parts.

Because the noise turned out to be most offensive when in the same range as the human voice, the authors speculate that because previous studies have shown that the human ear canal is shaped in such a way as to amplify frequencies in the human voice range, other noises that appear in that range that are amplified as well, come across as harsh and offensive.

The two conclude that the reason people react so badly to fingernails scraping a chalkboard is because of the frequency range of the sounds that are produced combined with the structure of the ear canal, and that the effect is worsened when the person hearing it knows its source.

More information: Psychoacoustics of chalkboard squeaking, ASA Lay Language Papers, 162nd Acoustical Society of America Meeting, www.acoustics.org/press/162nd/Oehler_4pPP6.html