Dissonant tones sound fine to people not raised on Western music - Musical perception is, surprisingly, not shared by all humans.
CATHLEEN O'GRADY - 7/16/2016, 7:00 AM

The notes used in Western music—or, more accurately, the relationships between the notes used in Western music—have a strange power. Bobby McFerrin demonstrated this dramatically by showing that an audience somehow knows what notes to sing when he jumps around the stage. He remarked that "what's interesting to me about that is, regardless of where I am, anywhere, every audience gets that."

He's suggesting that something about the relationships between pitches is culturally universal. All people seem to experience them the same way, regardless of where they're from or whether they have musical training. The question of universals in music perception is important because it can help us determine how much of our perception is shaped by culture and how much by biology. A paper in this week's *Nature* reports on the surprising finding that a form of musical perception long thought to be common across all humans might not be so universal after all.

In music, relationships between notes can be used in two different ways. If pitches are played in sequence, the relationships between them are melodic, like the difference between each successive note in "Mary had a Little Lamb." When notes are played simultaneously, like a single strum of all the strings on a guitar or a choir singing, the relationships are harmonic. Different musical traditions have different rules about which melodic and harmonic relationships are permissible.

In Western music, certain harmonic combinations sound pleasant, or "consonant," while "dissonant" combinations are unpleasant. Composers sometimes use dissonance (for example, in jazz or the *Jaws* theme tune) to create emotional, textural, or other artistic effects. The perception of consonance as pleasant and dissonance as unpleasant seems to hold true regardless of whether someone has musical training.

One potential explanation for this experience is the ratios between the frequencies of the pitches in a chord. For instance, if the sound waves of one pitch oscillate at a particular frequency, and the waves of the other pitch oscillate at twice that frequency, the ratio of the frequencies is 2:1. Consonant frequency ratios seem to obey different mathematical rules from dissonant intervals. If this explanation is true, and the math of the intervals is what causes the experience, then people should have the same experience of dissonance and consonance, even if they have no exposure to Western music.

The Tsimane people have not had this exposure. They live deep in the Bolivian Amazon and have very limited contact with the West. Tsimane music also doesn't make use of harmony: only one series of notes is played at a time, so the relationships between notes don't matter in their musical tradition.

Josh McDermott, an MIT researcher interested in how people hear and process sound, led a team in gathering data from 64 Tsimane people, as well as 50 urban Bolivians, 25 US non-musicians, and 23 US musicians. Participants in the experiment were played a series of harmonies through headphones and asked to judge how pleasant they were. The Tsimane people "rated consonant and dissonant chords as equally pleasant," the authors write. "By contrast, Bolivian city- and town-dwellers exhibited significant preferences for consonance, albeit to a lesser degree than US residents."

With cross-cultural tasks, there is always a risk that participants don't have the right idea about what they should be doing. To control for this, the researchers also played participants vocal noises and found that all groups preferred laughter rather than gasps. This shows that the result wasn't due to a misunderstanding of the task or some other perceptual difference. The Tsimane really do not find Western consonance more pleasant.

In a second experiment, the researchers replicated the results in a different group of 49 Tsimane people and 47 musically trained people in the US. This time, they recorded Tsimane songs and pitch-shifted them to create artificially harmonized Tsimane songs, some with dissonant and some with consonant harmonies. Then, along with lone harmonies like in the first experiment, they asked participants to rate how pleasant the sounds were. Again, the Tsimane didn't find the dissonant Tsimane songs unpleasant. Westerners, for whom Tsimane songs were substantially foreign, found them more pleasant when they were consonant.

This suggests that preference for consonance over dissonance isn't baked into universal human auditory processing, but is rather something we develop by being exposed to certain kinds of frequency relationships in the music that we hear. It might be that, because Tsimane music doesn't make use of harmony, the Tsimane people might not develop preferences for certain harmonies over others. It's not clear whether they were even able to tell the difference between dissonance and consonance at all. Their brains might not have learned to tell the difference.

Cross-cultural research is vital for answering questions like these, but it's becoming more difficult, the authors write, "due to the diffusion of Western culture around the world." With something as simple as a radio allowing isolated populations access to Western music, studies like these are going to become more rare. It's essential for researchers to explore these questions while they can.

Nature, 2016. DOI: 10.1038/nature18635 (About DOIs).

(accessed on 9.8,16 at http://arstechnica.com/science/2016/07/the-jaws-theme-might-not-be-scary-for-tsimane-people/