Three potentially unique acoustic features of healing music that transcend genre identified

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There are three potentially unique acoustic features of healing music that transcend musical genres, suggests research published in the open access journal *General Psychiatry*.

The findings might help to personalize playlists for patients, using artificial intelligence to analyze individual physiological and psychological responses, and help to evaluate the effectiveness of existing music therapies, suggest the researchers.

Despite evidence of the therapeutic effects of music for mental health issues, such as anxiety, depression, and post traumatic stress disorder, there's no consensus on what defines healing music, note the researchers.

They therefore wanted to find out if healing music shares certain acoustic features, irrespective of genre, and if these features are distinct from those found in regular music.

To compile a healing music library they drew on the recommendations of 35 therapists all of whom had several years of experience in music therapy practice and/or research.

This produced a collection of 165 different pieces of music that the experts frequently used in their daily practice or believed to be helpful for emotional and other mental health issues.

These were compared with 330 classical music pieces written by 10 composers and played on 11 instruments; 50 pieces of traditional five-element Chinese music; 100 Jazz recordings; and 300 emotional music recordings from the Chinese affective music system (CAMS).

Traditional Chinese five-element music comprises five different tones or pitches, each of which connects to the liver, heart, spleen, lungs, and kidneys, corresponding to the five elements of wood, fire, metal, earth, and water.

The CAMS covers seven distinct emotional states: happiness; calm; sadness; fear; disgust; anger; and surprise. Each clip is accompanied by a

set of indicator data, two of which were used in this study: valence, which describes the ability of music to evoke feelings of happiness or sadness; and arousal.

The pieces included nine different genres: classical; electronic; rhythm and blues (R&B); fim scores (soundtrack); folk; jazz; military (marching) music; New Age; and pop.

Classical music accounted for the largest proportion (28.5%) of recommendations, followed by pop music (18%). None of the remaining genres accounted for more than 15% of the total. Five participants nominated "Castle in the Sky" by Japanese musician Joe Hisaishi.

The researchers then used a tool (Mirtoolbox) specifically designed for the extraction of musical features from audio files for statistical analysis, segmentation, and clustering.

This produced 370 acoustic features which were grouped into five dimensions:

1. Energy, volume, and loudness
2. Rhythm (tempo and beat)
3. Timbre
4. Pitch (frequency and harmonicity)
5. Key (tonal field).

Around one in four (25.5%) of these features were specifically associated with their genre, but the rest were shared among all the genres.

To find out if these commonalities contributed to the healing properties of the music, they were compared with the healing classical music pieces and traditional five-element Chinese music.

This showed that more than a quarter (26%+) of the acoustic features differed significantly between the 'healing' pieces of classical music (47) and the regular classical music pieces.

And there was strong evidence that all the healing music pieces and traditional Chinese music shared nearly 10% of their acoustic features.

Based on this, three potentially distinctive acoustic features of healing music were identified that were independent of genre, differed from regular music of the same genre, and were consistent across various different types of healing music.

These three features significantly predicted both subjective valence and arousal ratings in the CAMS.

These were the standard deviation (SD) of the roughness, mean (average), and period entropy of the third coefficient of the mel-frequency cepstral coefficients (MFCC3).

The SD of the roughness describes the extent to which perceived irregularity or harshness of a sound deviates from the average; the MFCC captures the amount of energy in different frequency ranges, with mean referring to the average, and period entropy referring to the randomness or predictability in patterns of frequency components over time.

Given the ability of roughness to create different moods and emotional responses in listeners, this is an essential perceptual feature of music, say the researchers.

"For example, dissonant intervals in music with a high roughness can evoke feelings of tension or suspense, whereas consonant intervals in music with smoother sounds can evoke a sense of relaxation or

resolution," they explain.

The findings were validated when the acoustic features of the jazz pieces in the healing music collection were compared with those of regular jazz music.

And they echo those of previous research indicating that music is a universal language that transcends culture and genre, say the researchers. This includes traditional music forms, such as pilgrimage songs in Nigeria, high-life drumming in Ghana, singing bowl music in India, and five-element music in China.

They acknowledge that they relied on a relatively small number of experts to create their healing music collection and that cultural factors may limit the wider applicability of their findings.

But they suggest that incorporating the three acoustic features into music could enable health care professionals to personalize therapeutic playlists for patients, by harnessing AI algorithms to analyze physiological and psychological responses in real time.

"The implications of these findings can be applied in diverse contexts, such as music therapy for stress reduction, mental health and chronic pain management," they conclude.

More information: Uncovering potential distinctive acoustic features of healing music, *General Psychiatry* (2023). DOI: 10.1136/gpsych-2023-101145

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