

Decoding the natural soundtrack—human emotions influenced by the acoustic environment

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Credit: Bill Kuffrey/public domain

(Medical Xpress)—Cognitive and emotional sensitivity to the environment are critical for survival, and researchers have speculated that human emotions might track to specific changes in the acoustic environment. In a recent study published in the *Proceedings of the National Academy of Sciences*, researchers in Australia and China report

that changes in acoustic attributes known to evoke emotional responses in speech and music also stimulate an emotional response when they occur in nature, including sounds arising from human speech, wind and weather, machinery and natural phenomena. This is evidence, they suggest, that protolanguage vocalizations mimicking natural sounds eventually resulted in the evolution of music systems.

In order to test a range of acoustic phenomena and the emotional responses provoked in people, the researchers selected four types of environmental sounds containing six exemplars each: human actions, animal sounds, machine noise, and sounds in nature. For each of the 24 sounds, the researchers altered the frequency spectrum, intensity and rate to produce three acoustic manipulations of each sound. Participants were asked to rate the difference in emotional character between versions of the sounds. Their instructions included the directive, "To help you do this task, you might imagine that you are a film director, and your sound editor has introduced a series of environmental sounds in order to create an overall mood for the film. Imagine that you are giving your sound editor feedback about her choice of sounds, and the moods that they evoke." And in another experiment, participants were additionally asked to complete a visual emotional judgment task while the environmental sounds were presented.

The researchers concluded that the presence of changes in sounds irrelevant to the visual stimuli affected the emotional decoding of facial expressions, suggesting strongly that humans are continually attuned to changes in the auditory environment. "The results also suggest that the [acoustic environment](#) can shape our visual perception of emotion: Our interpretation of what we see is affected by what we hear," the authors write.

These effects, they suggest, support Darwin's musical protolanguage hypothesis, which suggests that a transition occurred in human

development from emotional communication based on the imitation of environmental sounds to the evolution of speech and music. The authors write, "It is possible that emotive vocalizations gradually came to stand for internal states, including the emotional states of conspecifics. Thus, emotional mimesis may have allowed early hominins to share biologically significant information efficiently." The idea is that eventually, human memory was insufficient to for storing and processing this accumulated collective information, leading to the development of elaborate symbolic systems including spoken and written language, and mathematics.

Similarly, some evolutionary biologists posit that protolanguage could not convey the full spectrum of complex emotions associated with large social groups, resulting in the separate branching of language and music systems. Musical systems enabled the efficient expression of emotion, facilitating groups and nurturing social bonds. The current research supports this concept, though the authors state that further research is required.

Nonetheless, the findings do confirm the emotional power conferred by environmental sounds and their influence on the interpretation of emotion from visual sources. More information about these connections could eventually lead to better models of emotional acoustics that predict how environmental stimuli influence our perceptions of people and events.

More information: Weiyi Ma and William Forde Thompson. Human emotions track changes in the acoustic environment. *PNAS* 2015 ; published ahead of print November 9, 2015, [DOI: 10.1073/pnas.1515087112](https://doi.org/10.1073/pnas.1515087112)

Abstract

Emotional responses to biologically significant events are essential for

human survival. Do human emotions lawfully track changes in the acoustic environment? Here we report that changes in acoustic attributes that are well known to interact with human emotions in speech and music also trigger systematic emotional responses when they occur in environmental sounds, including sounds of human actions, animal calls, machinery, or natural phenomena, such as wind and rain. Three changes in acoustic attributes known to signal emotional states in speech and music were imposed upon 24 environmental sounds. Evaluations of stimuli indicated that human emotions track such changes in environmental sounds just as they do for speech and music. Such changes not only influenced evaluations of the sounds themselves, they also affected the way accompanying facial expressions were interpreted emotionally. The findings illustrate that human emotions are highly attuned to changes in the acoustic environment, and reignite a discussion of Charles Darwin's hypothesis that speech and music originated from a common emotional signal system based on the imitation and modification of environmental sounds.

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