

# Musicians' Brains 'Fine-Tuned' to Identify Emotion

March 3 2009

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(PhysOrg.com) -- Looking for a mate who in everyday conversation can pick up even your most subtle emotional cues? Find a musician, Northwestern University researchers suggest.

In a study in the latest issue of *European Journal of Neuroscience*, an interdisciplinary Northwestern research team for the first time provides biological evidence that musical training enhances an individual's ability to recognize emotion in sound.

"Quickly and accurately identifying emotion in sound is a skill that translates across all arenas, whether in the predator-infested jungle or in the classroom, boardroom or bedroom," says Dana Strait, primary author of the study.

A doctoral student in the Henry and Leigh Bienen School of Music, Strait does research in the Auditory Neuroscience Laboratory directed by neuroscientist Nina Kraus. The laboratory has done pioneering work on the neurobiology underlying speech and music perception and learning-associated brain plasticity.

Kraus, Northwestern's Hugh Knowles Professor of Communication Sciences and Neurobiology; Richard Ashley, associate professor of music cognition; and Auditory Neuroscience Laboratory manager Erika Skoe co-authored the study titled "Musical Experience and Neural Efficiency: Effects of Training on Subcortical Processing of Vocal Expressions in Emotion."

The study, funded by the National Science Foundation, found that the more years of musical experience musicians possessed and the earlier the age they began their music studies also increased their nervous systems' abilities to process emotion in sound.

"Scientists already know that emotion is carried less by the linguistic meaning of a word than by the way in which the sound is communicated," says Strait. A child's cry of "Mommy!" -- or even his or her wordless utterance -- can mean very different things depending on the acoustic properties of the sound.

The Northwestern researchers measured brainstem processing of three acoustic correlates (pitch, timing and timbre) in musicians and non-musicians to a scientifically validated emotion sound. The musicians, who learn to use all their senses to practice and perform a musical piece, were found to have "finely tuned" auditory systems.

This fine-tuning appears to lend broad perceptual advantages to musicians. "Previous research has indicated that musicians demonstrate greater sensitivity to the nuances of emotion in speech," says Ashley, who explores the link between emotion perception and musical experience. One of his recent studies indicated that musicians might even be able to sense emotion in sounds after hearing them for only 50 milliseconds.

The 30 right-handed men and women with and without music training in the *European Journal of Neuroscience* study were between the ages of 19 and 35. Subjects with music training were grouped using two criteria -- years of musical experience and onset age of training (before or after age 7).

Study participants were asked to watch a subtitled nature film to keep them entertained while they were hearing, through earphones, a

250-millisecond fragment of a distressed baby's cry. Sensitivity to the sound, and in particular to the more complicated part of the sound that contributes most to its emotional content, was measured through scalp electrodes.

The results were not exactly what the researchers expected. They found that musicians' brainstems lock onto the complex part of the sound known to carry more emotional elements but de-emphasize the simpler (less emotion conveying) part of the sound. This was not the case in non-musicians.

In essence, musicians more economically and more quickly focus their neural resources on the important -- in this case emotional -- aspect of sound. "That their brains respond more quickly and accurately than the brains of non-musicians is something we'd expect to translate into the perception of emotion in other settings," Strait says.

The authors of the study also note that the acoustic elements that musicians process more efficiently are the very same ones that children with language disorders, such as dyslexia and autism, have problems encoding. "It would not be a leap to suggest that children with language processing disorders may benefit from musical experience," says Kraus.

Strait, a pianist and oboe player who formerly worked as a therapist with autistic children, goes a step further. Noting that impaired emotional perception is a hallmark of autism and Asperger's syndromes, she suggests that musical training might promote emotion processing in these populations.

Source: Northwestern University

Citation: Musicians' Brains 'Fine-Tuned' to Identify Emotion (2009, March 3) retrieved 19 September 2024 from

<https://medicalxpress.com/news/2009-03-musicians-brains-fine-tuned-emotion.html>

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