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The Sound of Passion

Musical training sharpens the ability to sense emotions.

By Patricia Moreau

Imagine a quiet night like any other. Suddenly, your infant's cries break the silence. Fully loaded with emotion, the sound triggers an urge to stand up and run to your infant's room. But, considering that your spouse is a musician and you are not, who will be the first to reach the crib?

According to Dana L. Strait and a team of researchers at Northwestern University in Illinois, the musician should win the race. Their latest study showed that years of musical training leave the brains of musicians better attuned to the emotional content, like anger, of vocal sounds. Ten years of cello, say, can make a person more emotionally intelligent, in some sense. So the alarm carried in a baby's cry make a deeper impression; your spouse wins the race.

The new work is part of an emerging portrait of the broader connections between music, emotion and speech. These studies are finding that musicians are more accurate in detecting emotion -- such as joy, sadness and anger -- in speech samples. The effect has been found even in children as young as 7 years old, with as little as one year of music training. It is a fascinating example of how experience in one domain (music) benefits another (emotion perception). However, it is not until very recently, with the publication of the new study by Strait and her colleagues, that the biological foundation of the effect has been demonstrated.

Strait's team decided to study the brain's very first responses to sound, in the brain stem. The brain stem is the most ancient part of the brain, andis the main entry door for all sensory stimuli. Once a sound reaches the nerves in your ears, it travels to the brain stem to be processed in an automatic, unconscious fashion. Both music and speech thus start their journey to the higher brain regions through the brain stem.

To record brain stem responses, the researchers placed electrodes on the heads of 30 people who were either musicians or non-musicians. The electrodes measured the electric currents that send signals through the brain stem, while the participants listened to an infant's unhappy cry.

The surprising result was that the musicians' brain showed enhanced responses to the infant's cries. And the greater the number of years of practice and the earlier the person began training, the stronger the signal.

But how can musical training account for musicians' advantage in detecting vocal emotion? Strait and her colleagues suggest that as we engage in activities that involve high levels of cognitive processing, such as memory or attention in music, we also enhance our sensory system's responses. The higher brain areas in the cortex are connected to lower brain areas, such as the brain stem, and, through these connections, the two areas influence each other.

However, there is still the question of causality: Does musical training really affect the brain or could it be that musicians are simply born with a different brain -- that they are naturally drawn to music by their cognitive strengths? Another study suggests that musical training really does drive changes in the brain. Daniel J. Bosnyak and a team of researchers at McMaster University in Hamilton, Ontario, demonstrated that the brain responses of a group of non-musicians could change as a result of their participation in a just two weeks of training to perceive pitches accurately.

With the emergence of brain imaging technologies, our understanding of the effects of music training on the brain has been advancing rapidly. For example, we now have clear evidence of morphological changes in the brain, such as enhanced volume in the cortical motor representation of the hands of string players or larger gray matter volume in parts of the musicians' auditory cortex dedicated to pitch processing. Numerous studies have also identified differences in patterns of brain activity between musicians and non-musicians. However, even with all this building evidence, we are still far from understanding exactly how music reshapes the structures and activity of the brain.

Surprisingly, even with all the remaining questions regarding musical training, the field of neuroscience of music has even more challenges to face. Although music processing has fascinated neuroscientists for more than a century, it is only in the last decade that it has become a subject of intense and systematic research. Aside from the effects of musical training, many more aspects of music, such as how we perceive it, how we enjoy it and how we make it, have been under the scope of researchers. There is general agreement that the brain is tuned for music, but untangling the complex circuitry behind the wondrous experience of it will require more research in this young and rich field.

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