

Speaking a tonal language (such as Cantonese) primes the brain for musical training

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Non-musicians who speak tonal languages may have a better ear for learning musical notes, according to Canadian researchers.

Tonal languages, found mainly in Asia, Africa and South America, have an abundance of high and low pitch patterns as part of speech. In these languages, differences in pitch can alter the meaning of a word. Vietnamese, for example, has eleven different [vowel sounds](#) and six different tones. Cantonese also has an intricate six-tone system, while English has no tones.

Researchers at Baycrest Health Sciences' Rotman Research Institute (RRI) in Toronto have found the strongest evidence yet that speaking a tonal language may improve how the brain hears music. While the findings may boost the egos of tonal language speakers who excel in musicianship, they are exciting neuroscientists for another reason: they represent the first strong evidence that music and language – which share overlapping brain structures – have bi-directional benefits!

The findings are published today in *PLOS ONE*, an international, peer-reviewed open-access science journal.

The benefits of [music training](#) for speech and language are already well documented (showing positive influences on [speech perception](#) and recognition, auditory working memory, aspects of verbal intelligence, and awareness of the sound structure of spoken words). The reverse – the benefits of language experience for learning music – has largely been unexplored until now.

"For those who speak tonal languages, we believe their brain's auditory system is already enhanced to allow them to hear musical notes better and

detect minute changes in pitch," said lead investigator Gavin Bidelman, who conducted the research as a post-doctoral fellow at Baycrest's RRI, supported by a GRAMMY Foundation® grant.

"If you pick up an instrument, you may be able to acquire the skills faster to play that instrument because your brain has already built up these auditory perceptual advantages through speaking your native tonal language."

But Bidelman, now assistant professor with the Institute for Intelligent Systems and School of Communication Science & Disorders at the University of Memphis, was quick to dispel the notion that people who speak tonal languages make better musicians. Musicianship requires much more than the sense of hearing and plenty of English-speaking musical icons will put that quick assumption to rest.

That music and language – two key domains of human cognition – can influence each other offers exciting possibilities for devising new approaches to rehabilitation for people with speech and language deficits, said Bidelman.

"If music and language are so intimately coupled, we may be able to design rehabilitation treatments that use musical training to help individuals improve speech-related functions that have been impaired due to age, aphasia or stroke," he suggested. Bidelman added that similar benefits might also work in the opposite direction. Musical listening skills could be improved by designing well-crafted speech and language training programs.

The study

Fifty-four healthy adults in their mid-20s were recruited for the study from the University of

Toronto and Greater Toronto Area. They were divided into three groups: English-speaking trained musicians (instrumentalists) and Cantonese-speaking and English-speaking non-musicians. Wearing headphones in a sound-proof lab, participants were tested on their ability to discriminate complex musical notes. They were assessed on measures of auditory pitch acuity and music perception as well as general cognitive ability such as [working memory](#) and fluid intelligence (abstract reasoning, thinking quickly).

While the musicians demonstrated superior performance on all auditory measures, the Cantonese non-musicians showed similar performance to musicians on music and cognitive behavioural tasks, testing 15 to 20 percent higher than that of the English-speaking non-musicians.

Bidelman added that not all tonal languages may offer the music listening benefits seen with the Cantonese speakers in his study. Mandarin, for example, has more "curved" tones and the pitch patterns vary with time – which is different from how pitch occurs in music. Musical pitch resembles "stair step, level pitch patterns" which happen to share similarities with the Cantonese language, he explained.

Bidelman's research team included Sylvain Moreno, senior scientist with Baycrest's RRI and lead scientist with the Baycrest Centre for Brain Fitness; and Stefanie Hutka, an RRI graduate student and PhD student in the Department of Psychology, University of Toronto.

The GRAMMY Foundation, which supported the study, works in partnership with its founder The Recording Academy® to bring national attention to important issues such as the value and impact of music and arts education.

Provided by Baycrest Centre for Geriatric Care

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