

Training and experience can affect brain organization, research shows

November 4 2007

New research comparing music conductors and non-musicians shows that both the conductors and the non-musicians “tuned out” their visual sense while performing a difficult hearing task. As the task became harder, however, only the non-musicians tuned out more of their visual sense, indicating that the training and experience of the conductors changed how their brains work.

The research, a joint project of Wake Forest University Baptist Medical Center and the University of North Carolina at Greensboro (UNCG) Music Research Institute, was presented today at the 37th annual meeting of the Society for Neuroscience in San Diego, Calif.

The study involved 20 conductors and 20 musically untrained subjects. The subjects were between the ages of 28-40, and the conductors had an average of more than 10 years of experience as a band or orchestra director in middle or high school.

The study used functional magnetic resonance imaging (fMRI), which shows which areas of the brain are active during a task. The scanner confirmed that while activity increased in the auditory part of the brain during the hearing task, activity in the visual part actually decreased.

“Imagine the difference between listening to somebody talk in a quiet room, and that same discussion in a noisy room. You don’t see as much of what’s going on in the noisy room. This is like closing your eyes to listen to music,” said Jonathan H. Burdette, M.D., senior researcher.

Burdette is an associate professor of radiology and a member of the Advanced Neuroscience Imaging Research Laboratory at Wake Forest Baptist.

While lying in an fMRI scanner, the subjects heard two tones that were clearly different (middle A and E on a music scale) but began at almost the same time, only a few thousandths of a second between them. The subjects had to report which tone began first. The study was made harder by moving the tones closer together in time. The subjects were not allowed to close their eyes.

The difficulty was adjusted for each person before the scanning to ensure that the task would be equally difficult for everyone. Because conductors are good at these kinds of tasks, the tones were moved much closer together for them.

“Because the task was equally difficult for everybody, the difference observed between conductors and non-musicians must be related to a change in how they deal with irrelevant sensory information, and not just their ability to do the task,” said W. David Hairston, Ph.D., the lead author, a post-doctoral fellow in Radiology and the ANSIR lab.

“In general, based on the non-musicians, we suggest that the brain actively increases how much information from other senses gets filtered out or ignored when you have to concentrate really hard on one sense,” Hairston said.

He said that conductors, on the other hand, routinely must differentiate very subtle differences in sounds. In addition, they commonly must do this in an ensemble setting, where keeping track of what they see is very important, such as reading scores or pointing out who played the wrong note. The research supports the theory that this experience leads to an ability to focus on a difficult auditory task without having to increase the

suppression of visual information.

“Together, these results show that how the brain filters information from different senses is very flexible and adaptive, and changes with the demands of the task at hand. Additionally, how this operates can change with highly specialized training and experience,” said Hairston.

Burdette said that future research might compare different kinds of musicians, such as pianists and horn players, for differences in brain organization.

Source: Wake Forest University Baptist Medical Center

Citation: Training and experience can affect brain organization, research shows (2007, November 4) retrieved 1 May 2024 from <https://medicalxpress.com/news/2007-11-affect-brain.html>

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