

More Evidence That Music Benefits the Brain

Megan Brooks | November 18, 2013

SAN DIEGO, California — A trio of new studies shows that musical training affects the structure and function of different regions of the brain, how those regions communicate during the creation of music, and how the brain processes different sensory stimuli.

These insights point to potential new roles for musical training, including fostering brain plasticity, providing an alternative educational tool, and treating learning disabilities, researchers say.

The studies were presented here at Neuroscience 2013, the annual meeting of the Society for Neuroscience.

"Playing a musical instrument is a multisensory and motor experience that creates emotions and motions — from finger tapping to dancing — and engages pleasure and reward systems in the brain. It has the potential to change brain function and structure when done over a long period of time," Gottfried Schlaug, MD, PhD, from Harvard Medical School and Beth Israel Deaconess Medical Center (Boston, Massachusetts), an expert on music, neuroimaging, and brain plasticity, said in a conference statement.

These new findings show that "intense musical training generates new processes within the brain, at different stages of life, and with a range of impacts on creativity, cognition, and learning," said Dr. Schlaug, who moderated a press conference where the research was discussed.

Start Music Lessons Early

In one study, researchers found that musical training at a young age may strengthen the brain, especially regions that influence language skills and executive function.

Yunxin Wang, from the State Key Laboratory of Cognitive Neuroscience and Learning at Beijing Normal University in China, and colleagues investigated the effects of music training on brain structure in 48 Han Chinese adults aged 19 to 21 years. All of them had had formal musical training for at least a year, beginning sometime between age 3 and 15.

After controlling for relevant cofactors, they found that the volume of brain regions related to hearing and self-awareness appeared to be larger in those who began taking music lessons before age 7. This hints that early musical training could potentially be used as a therapeutic tool, they say.

"Early musical training does more good for kids than just making it easier for them to enjoy music; it changes their brain and these brain changes could lead to cognitive advances as well. Our study provides evidence that early music training could change the structure of the brain's cortex," Wang noted in a conference statement.

"There is a lot of research showing that musical training has various cognitive benefits, such as better working memory, pitch discrimination performance, and selective attention," Wang told *Medscape Medical News*.

"In our study we didn't include any behavioral data but as we found that onset age of musical training was correlated with brain structural changes in regions related to several cognitive functions, such as language production (lingual gyrus) and auditory ability (superior temporal gyrus), it might be possible that some specified musical training could be applied to education in the future," Wang said.

The study was supported by the China's Ministry of Education and National Natural Science Foundation.

A study published earlier this month showed that childhood music lessons have neural benefit decades later. [As reported by Medscape Medical News](#), the researchers found that older adults who took music lessons as children but haven't

actively played an instrument in decades have a faster brain response to a speech sound than individuals who never played an instrument.

Music Training Influences Multiple Senses

A second study presented at Neuroscience 2013 hints that musical training improves the ability of the nervous system to integrate information from multiple senses.

"Implications of these results are clearly in the rehabilitation field," Julie Roy, graduate student in speech pathology and audiology at the University of Montreal, Quebec, Canada, told *Medscape Medical News*.

Prior research on the sensory impact of musical training has focused on audiovisual processing, she explained. Her study, she said, suggests a broader role for musical training in improving the ability of the nervous system to integrate information from all senses.

To gauge how musical training may affect multisensory processing, the researchers administered 2 tasks that simultaneously engage the sense of touch and hearing to a group of highly trained musicians and a group of nonmusicians.

Test results showed that musicians and nonmusicians had identical capabilities to detect and discriminate information based on a single sense, but the musicians were better able to separate auditory and tactile information. This finding suggests that long-term musical training influences multisensory processing, the researchers say.

"By finding that even though using different modalities and nonmusical stimuli, musicians still seem to have enhanced multisensory processing, we are one big step further down the road in affirming that musicians have overall enhanced multisensory processing," Roy told *Medscape Medical News*.

"We live in a multisensory environment where auditory and tactile information are processed together to give us the perception of the world as we know it. Knowing that musical training can indeed enhance this processing is of crucial importance when speaking about people with disability in one or both of those modalities, but even with people recovering from a stroke, for example, or diagnosed with a degenerating disease, or again, simply aging," she noted.

The study was supported by the Quebec Health Research Fund and the National Sciences and Engineering Research Council of Canada.

Musical Improv Strengthens Brain Circuits

A third study presented at the conference sheds light on the neural basis of musical creativity. The researchers used functional MRI to study neural correlates of musical improvisation in 39 professional pianists with varying degrees of improvisational training.

Ana Pinho, MS, from the Karolinska Institutet, Stockholm, Sweden, and colleagues found that experienced improvisers showed increased functional connectivity with other motor, premotor, and prefrontal regions, after adjustment for age and general piano playing.

"The findings support that improvisation training has specific effects on neural networks involved in musical creativity. Extensive experience with improvisation is associated with lower levels of activity in frontal and parietal association areas, regions which are central for cognitive control, working memory, and explicit response selection, suggesting that generation of meaningful musical materials can be more automated or performed with less attentional effort," they explain in a meeting abstract.

"This study raises interesting questions for future research, including how and to what extent creative behaviors can be learned and automated," Pinho added in a statement.

The study was supported by the Swedish Research Council, Sven and Dagmar Salén Foundation, and Fundação para a Ciência e a Tecnologia.

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