

# Music and the Brain

## The Latest Research

### Executive Summary by Buzzy Green

The research is building to document that music training is an important force in intellectual development. The following is a summary (with minimal comments) of several recent publications that address this issue.

- I. Science Daily (March 13, 2007) - The April issue of *Nature Neuroscience* cites a research project to confirm that playing a musical instrument enhances the brainstem's sensitivity to speech sounds. The strongest implication for developmental issues is that the research did not measure sensitivity to musical stimulus, but sensitivity to vocal inflection of foreign language words not known by the research subjects. The brainstem, often called the reptilian brain, was previously thought to play only a passive role in auditory processing. This research discloses that trained instrumental musicians' brainstems actively perceive linguistic nuance at an autonomic level while non-musicians seem not to notice the same nuance unless it is the focus of their concentration. ("Musical Experience Shapes Human Brainstem Encoding of Linguistic Pitch Patterns." By Patrick Wong)
  
- II. Science Daily (June 22, 2006) - *The Annals of the New York Academy of Sciences Volume 1060* relates the results of a study that measures the grey matter in the auditory cortex of the right hemisphere of musicians compared to non-musicians. Scientists consistently find more grey matter in the auditory cortex of musicians, and they opine that these distinctions are not likely to be genetic, but are more likely evidence of brain development due to use and practice.
  
- III. Science Daily (September 27, 2007) - A Northwestern University study asserts that there are significant benefits to musicians using all of their senses to practice and perform music. The constant process followed by musicians alters the brain to better enhance the skills needed for speaking, and reading. The scientists stated that audio-visual processing was enhanced in the brains of musicians as

compared to non-musicians, including the subtleties of speech. Nina Kraus, Hugh Knowles Professor of communication Sciences and Neurobiology said, "Our study indicates that the high-level cognitive processing of music affects automatic processing that occurs early in the processing stream and fundamentally shapes sensory circuitry..." Doctoral student and lead author Gabriella Musacchia added, "Musicians have a specialized neural system for processing sight and sound in the brainstem, the neural gateway to the brain." Published in the September 24, 2007 Proceedings of the National Academy of Sciences as *Musicians Have Enhanced Subcortical Auditory and Audiovisual Processing of Speech and Music* by Gabriella Musacchia, Mikko Sams, Erika Skoe, and Nina Kraus, who is also Director of Northwestern University's Auditory Neuroscience Laboratory.

IV. Science Daily (September 20, 2006) - Research results published in the September 20, 2006 online edition of *Brain* show that the brains of musically trained children perform better on memory tests that are correlated with literacy, verbal memory, visio-spatial processing, mathematics, and IQ. The study measured changes in brain responses to sounds, revealing significant improvements in as little as four months in students between four and six years of age. Dr. Laurel Trainor is Professor of Psychology, Neuroscience and Behavior at McMaster University and the Director of the McMaster Institute for Music and the Mind. She said, "This is the first study to show that brain responses in young musically trained and untrained children change differently over the course of a year. These changes are likely to be related to the cognitive benefit that is consistently seen with musical training." The study was led by Dr. Trainor and Dr. Takako Fujioka of Baycrest's Rotman Research Institute. The researchers found music-related improvements which fit with the improvements in non-musical areas of memory development. The findings suggest that musical training is having an effect on the brain's wiring for cognitive functioning. From *Oxford University Press (2006, September 20) First Evidence that Musical Training Affects Brain Development in Young Children*