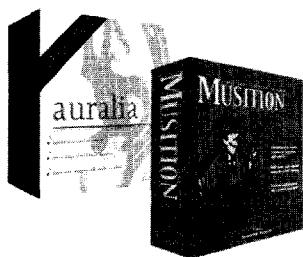


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POINT COUNTERPOINT

Music and the Brain: A Broad Perspective

The articles in this special focus issue of *MEJ* provide an exceptionally useful compendium of current research on music, the brain, and behavior. They also reflect some current tensions. For example, Donna Brink Fox calls for an "integrated delivery system" for early music education that includes shared responsibility among music educators, funding sponsors, parents, early childhood educators, and research scientists. However, Steven Demorest and Steven Morrison, in challenging selected reports of collateral benefits of music education, focus on negative aspects of relationships between researchers and music educators. Similar tensions are discernible in the reaction of the "Virtual Panel" to the slogan "music makes you smarter."

I would like to suggest how these various points of view and concerns can be reconciled by adopting a broader perspective, one that focuses on music as it relates to the basic cognitive and emotional systems that are the foundations of thought, feeling, and behavior. But, first, it will help to consider some of the points made in these special focus articles on "music and the brain."

In "Music and the Baby's Brain," Donna Brink Fox presents a persuasive argument for introducing music early in life. She further emphasizes the importance of "active" interactions vs. passive experiences in having lasting effects on brain and behavior. I am in complete agreement but would amplify this point by noting that passive exposure to music, even at a very early age, can engage a type of information storage generally termed "implicit memory." General musical architectures can be acquired to a considerable extent by mere exposure, as the infant

brain tries to make sense out of the stream of sounds it encounters, be they musical, linguistic, or other. These implicit memory structures form a necessary basis for more active engagement with music, which can start with toddlers in preschool. Therefore, a reasonable amount of background music, presented playfully to infants during waking hours and alone at bedtime, may not only set a mood but likely provide early musical experience that will later be beneficial for more directed, active engagement.

The review of brainwave studies by John Flohr, Daniel Miller, and Roger deBeus in "EEG Studies with Young Children," presents several very intriguing findings. For example, the 1997-98 study by Flohr and Miller (reported in 1999) found that after only ten weeks of music training, children 4-6 years of age exhibited EEG patterns similar to those of adult musicians. As music research must meet the same standards as other areas of science, appropriate control groups are needed, such as a group actively engaged in learning something other than music, rather than the nontreatment group used. We look forward to the publication of these findings in a peer-reviewed journal. Unfortunately, a very large number of music research studies have never undergone this process, including several cited in this article.

Don Hodges's review, "Implications of Music and Brain Research," is very comprehensive, concise, and clear. Among other very cogent points, Hodges emphasizes that the brain's organization for music is not simply one of left and right hemispheres, but rather one consisting of various "modules" that are distributed throughout the brain.

Steven Demorest and Steven Morrison have selected narrow grounds for their critique in "Does Music Make You Smarter." The original "Mozart effect," i.e., a ten-minute improve-

ment in a spatial-temporal task, expressed in IQ points, is largely if not entirely irrelevant for music education, whether or not it turns out to be completely substantiated or ultimately rejected. There are no practical implications for music education, and it strains credulity to think that a transient experience of any sort would have long lasting effects; the researchers Shaw and Rauscher never thought so. (A detailed review may be found in *MuSICA Research Notes*, Winter 2000, at www.musica.uci.edu.) So the "Mozart effect" serves in this article and elsewhere as a means of warning music educators about music scientists, sometimes in the guise of arguing that advocacy of music education should never include findings of beneficial effects of music on cognition. What is missing from this extreme point of view is not that music should be taught for its intrinsic benefits, which has universal agreement, but that music has major relevance in the overall development of children.

I suggest that we broaden our approach to music, the brain, and behavior by focusing on the fundamental systems that underlie all thought, emotion, and action. As Don Hodges emphasized in his article, music is likely processed in a distributed manner throughout the brain by neural modules that perform specific functions. It follows that the various modules are engaged according to task demands. For example, in learning to play a musical instrument, at least the following brain systems and processes are engaged: (a) sensory and perceptual—auditory, visual, tactile, and kinesthetic; (b) cognitive—symbolic and score reading; (c) planning; (d) motor actions—fine muscle and gross muscle coordination; (e) emotional/motivational; (f) learning; (g) memory; and (h) feedback and evaluation of music produced. The entire process then repeats, virtually every few seconds.

Furthermore, these brain systems and processes are being continually integrated in extremely complex ways, some operating in parallel, some sequentially. The production of music involves nuances that require "on-line" interactions of brain modules, such as accomplishing a particular phrasing to realize a specific emotional effect, all the while maintaining coordination with other members of an ensemble. Fundamental psychological processes, mental competencies, and attitudes toward learning are also involved. These include processes that certainly are of general applicability in life, such as creative thinking; problem solving; mentally constructing solutions and plans; and organizing thought, feeling, and knowledge into action.

Music education does not take place in a neural or psychological vacuum. While music study, listening, composition, improvisation, and performance from a score may engage unique combinations of brain modules or systems, these systems have not evolved just in case music developed in human culture. These systems, and their constituent brain cells, are not quiescent until "used" by music. In fact, "unused" neurons tend to lose their synaptic connections and wither. Therefore, we all need to work together to meet on the common ground of the integrating and developing brains of our children and grandchildren. We need to elevate our discourse to focus on how music engages the brain rather than to draw disciplinary boundaries where none exist in the brain. We owe the next generations our best combined efforts. —*Norman M. Weinberger, professor of neurobiology and behavior and director of MuSICA, Center for the Neurobiology of Learning and Memory, University of California—Irvine, and executive director of the International Foundation for Music Research, Carlsbad, California*

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John Kratus
School of Music
Michigan State University
East Lansing, MI 48824-1043
kratus@msu.edu
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