MMEA: Brain Research and Music: Separating the Myths from the Facts

by Marg Schmidt, St. Cloud State University

This is an excerpt of the presentation Marg gave at MMEA. Contact her at the address on page 5 if you would like the handouts or more information about her talk. [ed.]

For the last few years, the press has reported exciting claims about music's effect on brain development. Some examples:

- If you want children to do better in math, they need more music.
- Music lessons can boost your child's brain power.
- Music study can improve your child's ability to do science and math.

This seems to be great news for music teachers! Finally, something to help overcome the public's perception of music as an extra or a frill. Research is showing that the brain needs music.

But do we really know that? Research can prove all kinds of things, and it can prove contradictory things. Think of all the "scientifically proven" diets. What do we really know about the brain?

The Mozart Effect: What is it?

The term, "The Mozart Effect," has been used in a lot of ways. It is most reliably traced to experiments begun by Gordon Shaw, a physicist from U.C.-Irvine. He heard a lecture about brain neurons which reminded him of things he knew in the field of physics. He developed what he called the "trion" model of the brain, a set of complex mathematical equations. This model predicted maps of the neurons' firing patterns in doing spatial recognition tasks — recognizing and classifying physical similarities among objects. A colleague developed a computer program to display a visual and aural image of Shaw's equations. It made patterns that look like Native American bead work and sounded something like Mozart. Because the patterns changed in space over time, Shaw guessed that listening to Mozart might be related to a person's spatial-temporal reasoning. This is a particular form of intelligence on the IQ test, easy for people who do jigsaw puzzles.

Frances Rauscher, a psychologist and colleague of Shaw's, grew up in a musical home and played the cello from the time she was 4. In 1995, they gave 36 college students a test of spatial-temporal reasoning. Some students took the test after listening to ten minutes of Mozart's *Sonata for Two Pianos in DM*, some after listening to a self-hypnosis relaxation tape, and some after sitting in silence for 10 minutes. Listening to Mozart produced test scores 8–9 points higher, although the effect lasted only 10 minutes. Rauscher and Shaw guessed that this effect happened because somehow, listening to Mozart helps prime the firing patterns in the brain needed to do spatial-temporal tasks.

Other related experiments have been done since that time, and many of them are often called "The Mozart Effect." Similar studies have tried other music or sounds, with mixed results. Rauscher is now doing similar experiments with children, using classroom music instruments or pianos, as well as different methods of teaching (such as Orff and Suzuki methods). She's hoping to find whether the effect lasts and whether it makes a difference in the children's other school work.

These results have been picked up by the press and produced headlines such as "Music makes you smarter" and inspired a whole industry of tapes and CDs claiming to raise children's IQs. Rauscher is very embarrassed by such claims. She and Shaw claim only that listening to complex music may increase scores on a specific intelligence test for a limited time. They claim no certainty about *why* this relationship exists, *which music* produces it, or whether *other types of intelligence* are affected.

What do we know about the brain and learning?

In knowing what to do about the Mozart Effect research, first realize how little we really do know. Pat Wolfe, a leader in brain-based education, puts this in perspective: "What we know today about how the brain works is equivalent to the knowledge we had about the body when someone discovered that germs, not evil spirits, cause disease."

There are different perspectives on what we do and don't know about the brain. Some things we think we know:

1. Every experience changes the structure and physiology of the brain.
2. There are sensitive periods, or "windows of opportunity," for development of many of the brain's functions.
3. IQ and other intelligences are not fixed at birth.
4. Learning is strongly influenced by emotion; we need to feel safe and optimally challenged to be motivated to learn.

What applications do these points have for us as music teachers?

1. The types of experiences we provide for our students are critical. This point changes the saying, "Practice makes perfect," to "Practice makes permanent." All experiences build new connections in the brain, strengthen existing pathways, or permit the decay of already established circuits in the brain. So it's essential that we give our students experiences that strengthen the circuits that are involved in music-making.
2. We don't know that there is a sensitive period for music, but one recent study found that, of musicians with perfect pitch, 95% had begun music study before age 7. It's becoming more evident that Shinichi Suzuki and Edwin Gordon were on to something when they said music learning must be begun before age 9. I doubt that any harm can be done by our teaching as if every age is critical to music learning.
3. It's obvious that different people have different amounts of innate

ability in music. But brain research is confirming what most teachers already know: barring severe neurological impairments, no one lacks the ability to develop basic musicianship. Many American adults lack sufficient experience with music to feel successful, but this research should help us dispel the myth that participation in music is only for the "talented."

4. As musicians, all of us are keenly aware of the power of emotions to promote or interfere with learning; music is an inherently emotional experience. Brain research is showing how and why memories of certain performances stay with us forever, and how and why hearing a certain song can immediately take us back to a particular place with particular people, and also preserve the emotional sense of being there. This is a powerful tool that we have at our disposal; we need to use it consciously and wisely.

What should we do with this information?

Given all this, where does that leave us music teachers in relation to the Mozart Effect?

Gardner, Rauscher and Shaw, Marion Diamond, Pat Wolfe, and other leading researchers urge us to be cautious about claiming too much too soon. Brain research probably won't revolutionize the public's attitudes about music overnight. Research suggests that lots of experiences are important for children's development. Decisions about what is essential in the school curriculum are still basically decisions about values.

Many of the things we hear in the press are exaggerated claims. I think we're putting ourselves in a very precarious situation if we try to convince the decision makers in our school districts that music will make kids smarter. We really don't know that. We do know that playing an instrument produces a PET scan that lights up more of the brain than just about any other activity, but we don't know what that means — we think it must be good, but we don't know that. We know that students who participate in music have higher SAT scores. But we don't know if being in music causes those higher scores, or if something else contributes to it. We still are left with the problem that the most effective way to convince anyone of the value of music in their lives is to arrange for them to have powerful, positive, and directly personal experiences with music.

I'm very leery of using arguments that promote music for its benefits for students' work in math, science, or reading. We really believe music can affect us in powerful ways on its own power, and that's something no other subject can do. I'd love to see the day that the math teacher openly talks about how math study strengthens music skills.

We're beginning to be able to say that human urges for music are biologically based and are essential for healthy brain development. But we're a long way from having incontrovertible scientific proof that every living person needs music education. I myself am very hopeful that neurology, biology, psychiatry, and all those other fields will continue to discover that music really does play an essential role in human development. As musicians, we've always been convinced that music can affect us in profound ways, and the brain research is beginning to help us understand why and how.

Here are some useful resources:

Bruer, J.T. (1999). Neural connections: Some you use, some you lose. *Phi Delta Kappan* 81(4), 264-277.

Bruer, J.T. (1998). Brain science, brain fiction. *Educational Leadership* 56(3), 14-18.

Diamond, M., & Hopson, J. (1998). *Magic trees of the mind*. New York: Penguin Group. ISBN 0-525-94308-0

Jensen, E. (1998). *Teaching with the brain in mind*. Alexandria, VA: Association for Supervision and Curriculum Development.

Rauscher, F.H., & Shaw, G.L. (1998). Key components of the Mozart effect. *Perceptual and Motor Skills 86*, 835-841.

Reimer, B. (1999). Facing the risks of the Mozart effect. *Music Educators Journal 86*(1), 37-43. Reprinted in *Phi Delta Kappan 81*(4), 278-283.

Sprenger, Marilee. (1999). *Learning & memory: The brain in action*. Alexandria, VA: Association for Supervision and Curriculum Development.

Sylwester, R. (1995). *A celebration of neurons*. Alexandria, VA: Association for Supervision and Curriculum Development. ISBN 0-87120-243-3

Sylwester, R. (1998). Art for the brain's sake. *Educational Leadership 56*(3), 31-35.

Weinberger, N.M. (1998). The music in our minds. *Educational Leadership 56*(3), 36-40.

Marg Schmidt teaches courses in music education at St. Cloud State University and directs Spiritoso, a regional string orchestra for 6th–8th graders. Previously, she taught public school strings in Austin, MN, Albuquerque, NM, and Naperville, IL.