In Tune

by Gary L. Johnston
Inside Your Town newspaper
May 2004
Also in The Kentucky Post, June 30, 2004.

Music for Preemies

Brendan Christian Marks singing the Queen of the Night Aria from Mozart's opera, The Magic Flute

The call came in on my cellphone a couple of Sundays ago (4/18/04) as I was driving back from conducting a Brass Fellowship concert in Cincinnati. Our 28 year old pregnant daughter, Allison, was in severe pre-eclampsia and hemorrhaging. A few hours later and Brendan Christian Marx was born at 29 weeks - 11 weeks early. Unprepared, our priorities suddenly changed as our new Grandchild entered the world.

After visiting Brendan in the hospital several times, we noticed that even at 29 weeks, he was quite responsive to sounds. Allison asked me, "Shouldn't he be listening to music?" Suddenly, I was back in reality and scrambling to put together a special CD at her request. "Didn't you say that music aids brain development in very young children, Dad?" Indeed I had said that, and now I was being tapped to put my money where my mouth was!

The research seems clear enough to me, and so I have set out to fulfill her request. What research, you ask? Well, lets take a look.

There is abundance of evidence showing that the human fetus is aware of and responsive to sounds, including music (Lecanuet, 1996). Moments after birth a baby may turn in the direction of a voice, searching for the source. By the end of the first week, babies can select their mother's voice from among a group of female voices. Babies move their arms and legs in synchrony with the speech of caretakers. Five-month-old infants can discriminate differences in frequency less than one half step (Olsho 1984) and by the age of 8-11 months, they rely on melodic contour to make pitch discriminations (Trehub et al. 1984). (1)

Most are familiar with psychologist Fran Rauscher's "Mozart Effect." Among her provocative

conclusions:

- Very young children who take music lessons are better at certain tasks than other kids.
- Music can enhance reasoning abilities at any age.
- Complex music, such as a Mozart sonata, stimulates the brain. Simpler types, such as hard rock, may get feet moving but not make brain circuits fire faster.

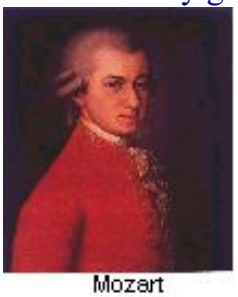
"These findings are very important and have huge implications," Rauscher says. "We think we have a powerful weapon for educators. Each child could have a chance to reach full potential."

In a study of 84 college students, she found that those who listened to Mozart's Sonata for Two Pianos in D Major for 10 minutes before taking IQ tests scored considerably higher than subjects exposed for the same period to silence or a meditation tape.

A subsequent pilot study of 3-year-olds found that those who were given music lessons scored "substantially better" on reasoning tests than other kids. The same experiment, produced similar results, "demonstrating an unmistakable link between music and spatial intelligence," Rauscher says.

The study with college students showed that the "Mozart Effect" made them smarter for only 15 minutes or so. But Rauscher says the impact lasts much longer with young people, "the younger the better."

Rauscher's research has found that those who study music and play it at a young age may boost cognitive skills permanently, by priming the brain to process certain kinds of information.
In the latest study, Rauscher and her colleagues studied children between ages 3 and 4 with similar demographic traits. They measured the IQs of the kids, who were divided into two groups. Nineteen received daily group singing lessons, weekly private lessons on electronic keyboards and daily keyboard practice. The other 14 received no musical training.


Mozart

"We found a big increase (in cognitive skills) in the kids who'd had lessons, both after four months and after eight months," she says. "This is the first (research) to really show the direct effect of music on this type of brain function."

After just four months, children taking music were scoring "significantly better" than the other group on spatial intelligence tests, and improvement continued until the end of the study, she says. Tests revealed that kids who had music lessons scored 43 percent higher than those who didn't.

Spatial intelligence is the ability to perceive the world accurately, to form mental images of physical objects and recognize variations of objects. It's necessary for such higher brain functions as complex mathematics and chess. "(It's) essential for architects, navigators, engineers, graphic designers and astronomers," Rauscher notes. (2)

One of my favorite quotes comes from Rauscher as she addresses her critics in an email to the research journal, Nature, "Because some people cannot get bread to rise does not negate the existence of a 'yeast effect.'" In fact, the Mozart Effect "has been replicated at least 12 times, 7 of which replications were carried out by independent laboratories." (3)

The musical advantage goes on well past the early years. Researchers found that children given piano lessons significantly improved in their spatial- temporal IQ scores compared to children who received computer lessons, casual singing, or no lessons. (4)

In the Kindergarten classes of the school district of Kettle Moraine, Wisconsin, children who were given music instruction scored 48 percent higher on spatial-temporal skill tests than those who did not receive music training. (5)


Psychologist Fran Rauscher

A research team exploring the link between music and intelligence reported that music training is far superior to computer instruction in dramatically enhancing children's abstract reasoning skills, the skills necessary for learning math and science. (6)

"Music education can be a positive force on all aspects of a child's life, particularly on their academic success. The study of music by children has been linked to higher scores on the SAT and other learning aptitude tests, and has proven to be an invaluable tool in classrooms across the country. Given the impact music can have on our children's education, we should support every effort to bring music into their classrooms." (7)

Students who report consistent high levels of involvement in instrumental music over the middle and high school years show significantly higher levels of mathematical proficiency by grade 12. This observation holds both generally and for low socioeconomic status students as a subgroup. In addition, absolute differences in measured mathematics proficiency between students consistently involved versus not involved in instrumental music grew significantly over time. (8)

Physician and biologist Lewis Thomas studied the undergraduate majors of medical school applicants. He found that 66 percent of music majors who applied to medical school were admitted, the highest percentage of any group. 44 percent of biochemistry majors were admitted. (9)

It is never too early to introduce a child to music. But at some point, it may be too late.

At birth a baby's brain contains 100 billion neurons, roughly as many nerve cells as there are stars in the Milky Way. Also in place are a trillion glial cells, which form a kind of honeycomb that protects and nourishes the neurons. But while the brain contains virtually all the nerve cells it will ever have, the pattern of wiring between them has yet to stabilize. Up to this point, says Shatz, "what the brain has done is lay out circuits that are its best guess about what's required for vision, for language, for whatever." And now it is up to neural activity--no longer spontaneous, but driven by a flood of sensory experiences--to take this rough blueprint and progressively refine it.

During the first years of life, the brain undergoes a series of extraordinary changes. Starting shortly after birth, a baby's brain, in a display of biological exuberance, produces trillions more connections between neurons than it can possibly use. Then, through a process that resembles Darwinian competition, the brain eliminates connections, or synapses, that are seldom or never used. The excess synapses in a child's brain undergo a draconian pruning, starting around the age of 10 or earlier, leaving behind a mind whose patterns of emotion and thought are, for better or worse, unique.

Deprived of a stimulating environment, a child's brain suffers.

The brain's greatest growth spurt, neuroscientists have now confirmed, draws to a close around the age of 10, when the balance between synapse creation and atrophy abruptly shifts. Over the next several years, the brain will ruthlessly destroy its weakest synapses, preserving only those that have been

magically transformed by experience. This magic, once again, seems to be encoded in the genes. The ephemeral bursts of electricity that travel through the brain, creating everything from visual images and pleasurable sensations to dark dreams and wild thoughts, ensure the survival of synapses by stimulating genes that promote the release of powerful growth factors and suppressing genes that encode for synapse-destroying enzymes. (10)

This gives a whole new meaning to the cliché, "use it or lose it."

Music, like no other human experience, involves and engages more parts of the brain simultaneously than any other. Depriving a young child of quality music in light of recent research is almost criminal. Yet many seem to either dismiss or be unaware of this research. But as for my family, give us music.

Happy Birthday, Brendan.

Gary Johnston
April 30, 2004

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"Musical training is a more potent force than any other, because rhythm and harmony find their way into the inner places of the soul." - Plato

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