



## The Benefits of Music Education

### The Benefits to the Brain: Cognitive Development

Adults who receive formal music instruction as children have more robust brainstem responses to sound than peers who never participate in music lessons and that the magnitude of the response correlates with how recently training ceased. These results suggest that neural changes accompanying musical training during childhood are retained in adulthood.

— Skoe, E. & Kraus, N. (2012). *A Little Goes a Long Way: How the Adult Brain Is Shaped by Musical Training in Childhood*, *Journal of Neuroscience*, 32 (34) 11510. DOI: 10.1523/JNEUROSCI.1949-12.2012

Students in high-quality school music education programs score higher on standardized tests compared to students in schools with deficient music education programs, regardless of the socioeconomic level of community.

Playing a musical instrument significantly enhances the brainstem's sensitivity to speech sounds. This relates to encoding skills involved with music and language. Experience with music at a young age can "fine-tune" the brain's auditory system.

— *Nature Neuroscience*, April 2007

Results From The Elementary School Study prove that:

- Students in top-quality music programs scored 22% better in English and 20% better in mathematics than students in deficient music programs.
- These academic differences were fairly consistent across geographic regions.
- Students at the four elementary schools with high-quality music programs scored better than students participating in programs considered to be of lower quality.

Results From The Middle Schools Study

- Students in top-quality instrumental programs scored 19% higher in English than students in schools without a music program, and 32% higher in English than students in a deficient choral program.
- Students in top-quality instrumental programs scored 17% higher in mathematics than children in schools without a music program, and 33% higher in mathematics than students in a deficient choral program.
- Students at schools with excellent music programs had higher English test scores across the country than students in schools with low-quality music programs; this was also true when considering mathematics.
- Students in all regions with lower-quality instrumental programs scored higher in English and mathematics than students who had no music at all.

— *Journal for Research in Music Education, June 2007; Dr. Christopher Johnson, Jenny Memmott*

Young Children who take music lessons show different brain development and improved memory over the course of a year, compared to children who do not receive musical training. Musically trained children performed better in a memory test that is correlated with general intelligence skills such as literacy, verbal memory, visiospatial processing, mathematics, and IQ.

— *Dr. Laurel Trainor, Prof. of Psychology, Neuroscience, and Behavior at McMaster University, 2006*

Stanford University research has found for the first time that musical training improves how the brain processes the spoken word, a finding that researchers say could lead to improving the reading ability of children who have dyslexia and other reading problems... 'Especially for children ... who aren't good at rapid auditory processing and are high-risk for becoming poor readers, they may especially benefit from musical training.'

— *From "Playing music can be good for your brain," SF Chronicle, November 17, 2005 (article on recent Stanford research study linking music and language)*

The musician is constantly adjusting decisions on tempo, tone, style, rhythm, phrasing, and feeling – training the brain to become incredibly good at organizing and conducting numerous activities at once. Dedicated practice of this orchestration can have a great payoff for lifelong attention skills, intelligence, and an ability for self-knowledge and expression.

— *From A User's Guide to the Brain, May 31, 2003; Ratey, John J., MD*

Learning and performing music actually exercise the brain – not merely by developing specific music skills, but also by strengthening the synapses between brain cells...What is important is not how well a student plays but rather the simultaneous engagement of senses, muscles, and intellect. Brain scans taken during musical performances show that virtually the entire cerebral cortex is active while musicians are playing. Can you think of better exercise for the mind/brain? In short, making music actively engages the brain synapses, and there is good reason to believe that it increases the brain's capacity by increasing the strengths of connections among neurons.

— *From "The Music in Our Minds," Educational Leadership, Vol. 56, #3; Norman M. Weinberger*

Music enhances the process of learning. The systems it nourishes, which include our integrated sensory, attention, cognitive, emotional and motor capacities, are shown to be the driving forces behind all other learning.

— *From Empathy, Arts and Social Studies, 2000; Konrad, R.R.*

Taking piano lessons and solving math puzzles on a computer significantly improves specific math skills of elementary school children. Children given four months of piano keyboard training, as well as time playing with newly designed computer software, scored 27 percent higher on proportional math and fractions tests than other children.

— *From Neurological Research, March 15, 1999; Gordon Shaw, Ph.D, University of California, Irvine*

Researchers at the University of Munster in Germany reported their discovery that music lessons in childhood actually enlarge the brain. An area used to analyze the pitch of a musical note is enlarged 25% in musicians, compared to people who have never played an instrument. The findings suggest the area is enlarged through practice and experience. The earlier the musicians were when they started musical training, the bigger this area of the brain appears to be.

— *From Nature, April 23, 1998; Christian Pantev, et al*

Nowhere in the spectrum of arts learning effects on cognitive functioning are impacts more clear than in the rich archive of studies, many very recent, that show connections between music learning or musical experiences and fundamental cognitive capability called spatial reasoning. Music listening, learning to play piano and keyboards, and learning piano and voice all contribute to spatial reasoning...In the vast literature on spatial reasoning (about 3,000 studies in some bibliographies), it is clear that mathematical skills as well as language facility benefit directly from spatial reasoning.

— *From James S. Catterall, UCLA, Fall 1997*

## **The Benefits to Students: Personal and Academic Success**

Nearly 100% of past winners in the prestigious Siemens Westinghouse Competition in Math, Science, and Technology (for high School students) play one or more musical instruments. This led the Siemens Foundation to host a recital at Carnegie Hall in 2004, featuring some of these young people. After which a panel of experts debated the nature of the apparent science/music link.

— *The Midland Chemist (American Chemical Society) Vol. 42, No.1, Feb. 2005*

Students consistently involved in orchestra or band during their middle and high school years performed better in math at grade 12. The results were even more pronounced when comparing students from low-income families. Those who were involved in orchestra or band were more than twice as likely to perform at the highest levels in math as their peers who were not involved in music.

— *From Catterall, James S., Richard Chapleau, and John Iwanaga (2002), "Involvement in the Arts and Human Development: Extending an Analysis of General Associations and Introducing the Special Cases of Intensive Involvement in Music and Theatre Arts." In R. Deasy (Ed.), Critical Links: Learning in the Arts and Student Achievement and Social Development, Washington, DC: AEP.*

Students at risk of not successfully completing their high school educations cite their participation in the arts as reasons for staying in school. Factors related to the arts that positively affected the motivation of these students included a supportive environment that promotes constructive acceptance of criticism and one where it is safe to take risks.

— *From The Role of the Fine and Performing Arts in High School Dropout Prevention, 2002; Barry, N., J. Taylor, and K. Walls*

Dr. James Catterall of UCLA has analyzed the school records of 25,000 students as they moved from grade 8 to grade 10. He found that students who studied music and the arts had higher grades, scored better on standardized tests, had better attendance records and were more active in community affairs than other students. He also found that students from poorer families who studied the arts improved overall school performance more rapidly than all other students.

— *From Catterall, UCLA, Fall 1997*

Second graders from a low income school in Los Angeles were given eight months of piano keyboard training, as well as time playing with newly designed music software. The result? These students, taking the Stanford 9 Math Test, went from scoring in the 30th to the 65th percentile. These second graders were performing sixth grade math. The critical point here is the students were not taught math using music...they were taught music. It was the process of learning music that helped improve their math skills.

—*From Neurological Research, March 15, 1999*

Students of lower socioeconomic status who took music lessons in grades 8–12 increased their math scores significantly as compared to non-music students. But just as important, reading, history, geography and even social skills soared by 40%.

—*From Nature, May 23, 1996; Gardiner, Fox, Jeffrey and Knowles*

A report released by the Texas Commission on Drug and Alcohol Abuse found that students involved in courses beyond the required 'basics' were less likely to be involved with drugs. The study went on to show that 'Secondary students who participated in Band or Orchestra reported the lowest lifetime and current use of all substances' (Alcohol, Tobacco, Marijuana or any illicit drug).

— *From Houston Chronicle, January 11, 1998*

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Learning in the arts nurtures motivation, including active engagement, disciplined and sustained attention, persistence and risk taking. It also increases attendance and educational aspirations.

— *From Critical Links: Learning in the Arts and Student Academic and Social Development, Arts Education Partnership, 2002*

Arts participation and SAT scores co-vary—that is, they tend to increase linearly: the more arts classes, the higher the scores. This relationship is illustrated in the 2005 results shown below. Notably, students who took four years of arts coursework outperformed their peers who had one half-year or less of arts coursework by 58 points on the verbal portion and 38 points on the math portion of the SAT.

	VERBAL	MATH
4+ Years of Arts	534	540
4 Years	543	541
3 Years	514	516
2 Years	508	517
1 Year	501	515
1/2 Year	485	502
Average for All SAT Test Takers	508	520

— *Source: 2005 College-Bound Seniors: Total Group Profile Report, The College Board, 2005*

Students of music continue to outperform their non-arts peers on the SAT, according to reports by the College Entrance Examination Board. In 2006, SAT takers with coursework/experience in music performance scored 57 points higher on the verbal portion of the test and 43 points higher on her math portion than students with no coursework or experience in the arts. Scores for those with coursework in music appreciation were 62 points higher on the verbal and 41 points higher on the math portion.

— *The College Board, Profile of College-Bound Seniors National Report for 2006*

### **Music Education: How Schools Are Doing**

The 1997 National Assessment of Educational Progress in arts education (visual art, music, theatre and dance) studied the general population of 8th graders across the country and found that students are not achieving at high levels in responding to, performing or creating works of art. However, NAEP found that students receiving classroom arts instruction outperformed other students and that instruction increased all of their arts abilities, including the ability to create works of quality that communicated complex ideas and feelings – a fundamental communication skill in contemporary society. Unfortunately, less than half of the nation’s 8th graders are being taught the arts...Even at schools where [music and art] courses are offered, not everyone takes part. Only one in four 8th graders reported being asked to sing or play a musical instrument at least once a week.

— *From 1997 National Assessment of Educational Progress in Arts Education*

With passage of a mill-levy in 1997, Adams 14 restored the arts, in fact making arts education central to the student (and parent) experience...student attendance, parent participation, and student achievement have soared: not one of the Adams 14 Schools has received an unsatisfactory rating on the state report cards.

— *From "Potent Partnerships: Community-based Resources for Arts Education," The State Education Standard, Winter 2004; Gully Stanford*

With its many challenges and opportunities, [No Child Left Behind] dominates the state and local education landscape today. What the long-term effects of NCLB will be on funding and support for arts education in the schools remain unclear. So far, the results have been mixed. Schools in some states report the amount of instructional time devoted to reading, writing, math and science has increased, while for the arts it has declined.

— *From "Academic Atrophy: The Condition of the Liberal Arts in America's Schools," Council for Basic Education, 2004; von Zastrow, Claus with Helen Janc*

...while virtually every state has adopted standards in the arts, only a few have incorporated the subject into their state accountability systems...[this can cause some states to] choose to narrow the curriculum in order to reach higher student achievements in a few subjects [such as math and reading].

— *From "The Complete Curriculum: Ensuring a Place for the Arts and Foreign Languages in America's Schools," NASBE, October 2003*

### **The Creative Economy: Work Force Preparation for the 21st Century**

Though it's crucial to invest in math, science and engineering, as the president outlined in his recent State of the Union address, there are other fields that hold more promise...Prefer a more artistic career? Our economy is poised to create new forms of entertainment, from rock 'n' roll and hip-hop to film and video games. Indeed, over the next 10 years, jobs in art, music, culture and entertainment will grow twice as many as jobs in engineering will.

— *From "A search for jobs in some of the wrong places," USA Today, February 12, 2006; Richard Florida*

Of course, both the fundamentals and the more creative fields are crucial to our economic success. The basics are not enough, though. What we really need in order to prepare our children for the creative economy is a comprehensive education, something that takes them from aesthetics to algebra without pretending that the two are mutually exclusive. We need to see to it that, from an early age, our entire population is encouraged to develop its people skills with its multiplication tables and its creative and entrepreneurial potential with its reading abilities.

— *From The Flight of the Creative Class: The New Global Competition for Talent, 2005; Richard Florida*