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## FOR THE PROFESSIONAL MUSIC EDUCATOR THE "MOZART EFFECT" - RESEARCH ON MUSIC AND THE DEVELOPING BRAIN, AND MORE ...

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### INTRODUCTION

Neuroscientists have intensified their research into music and its role in the developing brain. This is partly due to evolving diagnostic techniques and technology, and due, also, to the growing awareness of the probative opportunities presented by such studies. The Suzuki Music Academy produces this gateway to fascinating information and ideas arising from current research.

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## The Mozart Effect Online Resources on Music/Brain Research

The buzzword, "Mozart Effect", has been bandied about by popular print and broadcast media. It is featured in parenting, education, and music oriented publications, and in the mainstream general press. While it has renewed interest in classical music education and focused much deserved attention on the general field of childhood development, the phrase (and the popular notion of its meaning) has been used to sell music lessons, music products of all kinds, including "Mozart Makes You Smarter" product lines, and frankly, some music education snake-oil.

What's behind this popular "concept"? Where did it originate? What does it really mean? Does listening to Mozart really make you smarter? If so, how? In what way? Is this claim real or just a hype? What to make of it all?

Here is a collection of links to promotional pieces and authoritative online resources that can provide some answers. While there is editorializing and there are commentaries found on this page and in the linked material dealing with the research surrounding the "Mozart Effect", ultimately, the reader is responsible for applying critical thinking to sort it all out.

The term "Mozart Effect" arose from the work of University of California at Irvine's formidable team, Dr. Francis Raucher, Dr. Gordon L. Shaw, and their colleagues. Their neuroscience/music studies and their findings have caused quite an impact on related fields and some controversy. After exploring the materials, linked here, whatever conclusions you come to, you will have to admit that this is very



**[Listening to Music Enhances Spatial Task Performance](#)** - Design and Procedure for first of two studies (Rauscher, Shaw and Ky, 1993).

**[Research Findings Show Music Can Enhance Key Component of Human Intelligence](#)** -Description of second of two studies.

**[Music and Spatial Task Performance - References](#)** - References that underpin Rauscher, et. al., studies.

**[Music Beats Computers at Enhancing Early Childhood Development](#)** - Press release published by The American Music Conference, more on work by Frances H. Rauscher,*et al.*

**[Archive: Online Chat on the Research into Musically Enhanced Intelligence with Frances H. Rauscher](#)** - Frances H. Rauscher fields questions about Music/Brain research.

**[Music Training and "Spatial-Temporal Reasoning"](#)** - by Dr. Rauscher discusses the approach taken by Rauscher and colleagues that employs a concept of the mapping of pitches and instrumental timbre onto neural model, the use of computerized analogues of these, and the coding of aspects of musical structure in human composition and perception. Also, the notion of he shared neural networks activated in the processing of music and that of reasoning in spatial domains.

**[Background Information about Governor Miller's CD proposal](#)** - Description of the work of Francis Rauscher and colleagues that resulted the creation of public policy that promotes classical music for children.

**[Professor Chimes in on Benefits of Teaching Kids to Make Music](#)** - Article by Mark Ward appearing in the Milwaukee Journal Sentinel, April 8, 1997 - "Science Matters". This generally good non-technical report on the findings from the research of Francis Rauscher, et al, is flawed by the assertion that "Children whose brains don't make those connections at an early age may never make them. That's because after a few years their brains stop making so many connections and start pruning unused neurons." Ward corrects this, somewhat, by the writing that follows. **[see On the Importance of Being Accurate](#)**

**[Music/Arts Education Fact Sheet](#)** - Interesting references concerning the benefits that come from music study, published by The American Music Conference.

**[Music as a Window into Higher Brain Function - Research Chronology](#)** - Chronology published by The American Music Conference.

**[Correspondence: Music and Math](#)** - Thoughtful correspondence on the subject of music and its relationship to the causal effect of enhanced cognitive skills. The discussion here references the "Mozart Effect" and Rauscher and Shaw's findings.

[Keys to Reasoning - UCI Journal](#) - UCI Journal reports on work of Rauscher and Shaw.

[UC Irvine study shows that exposure to music enhances early childhood development of brain](#) - Media Release on Rauscher and Shaws studies.

[Music as a Window into Higher Brain Function - Research Chronology](#) - Just chronological reference here, published by The American Music Conference. Primarily of interest to those who want to know more about the particular sequence of research that has evolved into the most current studies undertaken by Rauscher, Shaw, Leng, et al. Tracks dates and gives a brief summary of the research.

[Report on Music Enhanced Cognitive Skills](#) - Summary and commentary on Gordon Shaws work with music and intelligence.

[Gordon Shaw Professor Emeritus - Elementary Particle Theory and Theoretical Neurobiology](#) - Background on Gordon L. Shaw, including a description of Shaw's approach to research that uses music to examine higher brain function, the spatial and temporal structure of the cortex, spatial-temporal neuronal firing patterns in the cortex, and the trion model of the cortex.

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## New Category (The "Beethoven Effect"?)

[Musical studies provide clues to brain functions](#) - An overview of music and perception studies, by Beth Azar, published on the APA Monitor site by the American Psychological Association. Ms. Azar begins the article by discussing the fact of Beethoven's work as an active composer after loosing his ability to hear, and she then proceeds to review the auditory mechanics of the inner ear and studies that are "mapping the brain", dealing with differentiated functions for right/left hemispheres.

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## The MuSICA Archive

Below are links to articles from the online journal, MuSICA, an especially valuable resource that deals with research into the music's role in brain developement. "The Mozart Effect" is only one of many intriguing subjects discussed. MuSICA's knowledgable editor, N. M. Weinberger, provides an exceptionally well-informed and balanced perspective on the subject of music/brain research in his reports and commentaries on the studies undertaken by neuroscientists who are engaged in research that explores the music/brain connection.

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## THE "MOZART EFFECT" AND ENHANCED INTELLIGENCE

**Mozart and Spatial Reasoning** - Report on research by Frances Rauscher, Gordon Shaw and Katherine Ky (Nature, 1993, 365, p. 611)

**Does listening to Mozart Affect Spatial IQ?** - Research on the effect of "passive listening" on brain function that is being carried out by Rauscher and colleagues at the University of California Irvine.

**On the Importance of Being Accurate** - N. M. Weinberger gives an excellent overview of the hype that has accompanied and trivialized the findings of the studies that have indicated the existence of a so-called, "Mozart Effect", and related current research that explores the connection between music and brain development.

## MORE ON MUSIC AND YOUNG CHILDREN

**NEW Musical Compositions by Schoolchildren** - Mozart is perhaps the best known of children composers, but children's capacity to compose is, by no means, confined to child prodigies. The process of musical composition encompasses a number of interrelated cognitive and perceptual operations. An overview of studies dealing with children and musical composition show results that raise interesting questions, as well as, answers.

**NEW Underestimating Young Children: Easy for Us, Hard on Them** - Editorial that deals with young children and early development of musical preferences and interests.

**NEW Infants have adult-like brain specializations for processing music.** Summary of the study by Balaban M.T., Anderson, L.M., & Wisniewski, A.B. (1998), "Lateral asymmetries in infant melody perception" *Developmental Psychology*, 34:39-48.

**Music and Cognitive Achievement in Children** - This report deals with the relationship between music education and cognitive achievement. It discusses and analyzes findings that suggest that: those receiving music education training have an advantage when learning to read, music/dance enhance "creativity", and, musical training enhances abstract cognitive ability in the area of spatial abilities.

**Music Alters Children's Brainwaves** - Reorganization of brain function and evidence of these processes in children are subjects of the study reported here.

**Music Aids Memory Retrieval in Infants** - Discussion of a study that uses music to probe the minds of infants.

**The Musical Foetus?** - Reports on research on musical effects on foetuses and neo-natals.

**The Musical Infant and the Roots of Consonance** - Discussion of the way consonance and dissonance is perceived and process.

**The Musical Infant - Studies Show Infants Are "Musical"** - Report on studies that explore the ability of infants to hear and process music.

**The Earliest Music Lessons** - Studies indicate a powerful music/language connection in infants.

## MUSIC, MEMORY, AND LEARNING

**The Neurobiology of the Benefits of Music** - Opinions and reports on music research and its meaning.

**The Neurobiology of Musical Learning and Memory** - Declarative and procedural memory and the neurological mechanisms involved in processing of music are the subjects of new music/brain research.

**Threads of Music in the Tapestry of Memory** - Studies involving music and contextual memory are reviewed.

**Music and Its Memories** - A discussion of declarative and procedural memory modes and how these are utilized in musical experience.

**Musicians' Memory For Tones** - About a study that suggests that musicians demonstrate enhanced capacity to memorize musical tones.

**Brain Cooperation** - Report on the research into the way different regions of the human brain cooperate in the processing of music.

**Creating Creativity With Music** - New studies employing diagnostic techniques for determining "creativity" and the music connection are reported.

## NURTURE VS. NATURE / EDUCATION VS. TALENT

**Is Everyone Musical?** - Reports on arguments supporting the idea that, traditionally, the role of inborn "talent" is greatly overstated. Music education professionals should take note of this excellent review.

**"Regular People" Have Musical Expertise** - Essay that revises traditional notions concerning the expertise of trained musicians and so-called, "regular people".

**Music, Development, Aging and the Brain - It's Never Too Late for Music** - This very important and extremely perceptive article/essay corrects the misguided notion that older students who are just beginning musical study are, somehow, "doomed". Bravo, Dr. Weinberger!

**"Music: Cultural Add-On or Biological Imperative ?"** - Convincing argument that supports the view that

music is a biological imperative.

[Sing, Sing, Sing!](#) - Musical expression as a biological imperative.

## MORE EXTRA-MUSICAL EFFECTS

[Does Music Have Cognitive "Spin-offs"?](#) - An uncommonly insightful essay about a subject that music education advocates tend to mindlessly hype. Here, Professor Weinberger manages to give due consideration to the whole question of the general benefits that music brings, while avoiding exaggerated claims.

["The Nonmusical Outcomes of Music Education"](#) - Discusses some of the problems encountered by music education advocates, re: communicating the extra-musical benefits that music study and appreciation bring.

[Wellness, Survival, Music and the Arts](#) - Report of preliminary demographic study of music's effect on health and longevity.

[Does music compensate for unmet emotional needs of musicians?](#) - Review of an interesting but inconclusive study that suggests a correlation between "musical responsiveness" and interpersonal competencies.

[More Brain, Better Fingering?](#) - Review of a study by Elbert and co-workers and reported in Science (1995, 270, 305-307). Elbert's team demonstrate "[i]ncreased cortical representation" in musicians, corresponding to activity of musician's fingers.

## MUSIC, EMOTION, AND MOOD

[Understanding Music's Emotional Power](#) - Speculation on the potential to study the emotional effect that music creates and reviews of the work of neuroscientists who have begun research into this area.

[The Coloring of Life: Music and Mood](#) - Essay that discusses the music/emotion link and the way music influences mood and memory.

[The Musical Hormone](#) - Deals with important hormonal effects that are related to musical experience.

[Children's Accurate Interpretation of Emotion in Music](#) - Report on preliminary studies that demonstrate children's ability to experience emotional meaning from music.

## BRAIN PROCESSING AND MUSIC PERCEPTION

**NEW**

**Musical Ability as an Independent Intelligence** - Briefly noted, the work of Daniel Levitin and Ursula Bellugi who are exploring the unique characteristics of Williams syndrome. Williams syndrome and the special musical aptitude those with Williams syndrome seem to possess were recently featured on CBS 60 Minutes.

**NEW**

**Background music enhances cognitive processes** - Brief note of "Cognitive test performance and background music" by Cockerton, T., Moore, S., & Norman, D. (1997) that appeared in publication, *Perceptual and Motor Skills*, 85:1435-1438. The study, while inconclusive, adds to the studies that are investigating the relationship between passive listening to music and cognitive performance.

**The Unconscious Musical Brain** - Reviews a study that tests the notion of inborn musical aptitude through the application of diagnostic technology that enables quantification of "pre-attentive" or unconscious perception.

**A Few Notes On Pitch** - is an article about studies of pitch perception that seek to define the role of the brain in the processing pitch.

**Musical Building Blocks in the Brain** - Explanation of perceptual integration in the processing of music.

**Sight-Reading Music: A Unique Window on the Mind** - Reflections about the process of sight-reading music and the probative value of examining this activity.

**Brain Coherence, Musicianship and Gender** - Report on research into the relationship between musical skills and anatomical differences in brains that are due to factors of training and gender.

**The Musician's Brain** - Review of preliminary studies and speculation about further inquiry concerning music and the brain of the musician.

**Melodic Therapy Changes Brain Activation and Promotes Language Recovery After Brain Damage** - Briefly noted, a study uses treatment of language dysfunction to show functional and physical evidence that underscores the connection between language and music.

## RESEARCH CONSIDERATIONS

**How About "Educational Trials" for Music?** - Under the heading "Matters of Opinion", this is a call for an expanded criteria in assessing the role and value of music in education and in general human experience.

**Music Neuroscience, Physiology and Medicine** - Thesis that interdisciplinary work with music and medicine is an essential area of study. Such approaches lead to more meaningful understanding of the role and processing of music.

**Music Therapy and Music Science: Past, Present and (?) Future** - Speculation on music therapy and its potential.

**Purists and Utilitarians** - Explanation of disparate viewpoints about music research held by some music educators.

**Research is Not Enough** - Appeal for more coordinated music research.

## **RAP? ELEVATOR MUSIC? HEAVY METAL?**

**Heavy Metal, Rap and Adolescent Behavior** - Discussion about the meaning of a study that explores the connection between Heavy Metal, Rap, and dysfunction in adolescent behavior.

**Radical Rap: A "Surprising" Finding** - A review of "soft" research carried out by Dolf Zillman and colleagues at the University of Alabama. The team's findings are surprising and interesting, if inconclusive.

**"Elevator Music": More Than It Seems** - A valiant and skilled defense of what "serious" musicians would consider "lightweight" music.

**Pre-teens: A Musical Time Slot?** - Anecdote and reflection.

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**PARENTING CENTRAL**

**Intellectual / Emotional Life of the Developing Child.**

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