

## Articles | A Spoonful of Music

By Robert Wyatt, DMA

Pierre sits at his desk displaying a sense of hopelessness that children should not have to experience. Only moments earlier he had raced across the playing field like a seasoned competitor; yet instead of passing the baton, he had used it to injure any classmate in his path. And now he suffers because the music class is beginning and he is excluded from actively participating.

Yet when the big hand drum begins to resonate, Pierre's foot responds; his eyes come alive again and his body awakens. As other instruments enter the musical mix, his hands begin an elaborate pas de deux, with the rhythm and the mood of the music determining the choreography. A smile returns to his face and all injustice is forgiven, his attention lives within the present moment of sound. Pierre has AD/HD and he is learning that its life and his life are not separate.

Consider for a moment the presence of the drum that shifted Pierre's attitude. By striking the dried and stretched hide with a mallet, sounds are produced which the brain automatically begins to process. As the sound waves cause the eardrum to vibrate, three bones in the middle ear are then set into motion, the last of which, through a membrane, stimulates a fluid-filled chamber containing microscopic sensing organs. These organs translate what was once a mechanical action into a complex of electronic signals. Along their way to the neo-cortex-their home base-these signals pass through the medulla (lower brain), midbrain and cerebrum before arriving in the auditory cortex. From here, electro-chemical signals are transmitted to every part of the body, affecting not only our sense of hearing but also our sensation of location, balance, emotional comfort and safety.

Amazingly enough, this mechanism for hearing is fully developed in the fetus at the age of 143 days. All sound detected from the mother-especially her heartbeat and respiration-and her environment is processed within the fetal brain, an organ which is developing more slowly than its hearing apparatus. In effect, the sense of hearing "grows" the brain in a variety of ways.

Is it not incredible that this extraordinary capability arises from such a minuscule system? Robert Jourdain mentions in his provocative book *Music, the Brain, and Ecstasy* that "Touch comes to us through square yards of skin, vision through square inches of retina, but the organ of Corti stands at but 1/250th of an inch. It is dwarfed by the cochlear chambers. A mere 14,000 receptor cells spawn the 32,000 nerve fibers that leave the cochlea and make their way toward the brain. By comparison, an eyeball's retina presents 100 million receptor cells to the world, and an optic nerve carries their information over a million fibers...[I]t is remarkable that, in a brain composed of billions upon billions of neurons, this slender channel gives rise to so much of our experience of the world."

Sound and music color every aspect of our world. Music is many things for people-enjoyment, intrigue, emotional suffering, relief, boredom, a soothing balm or cacophonous torture-and personal theories on musical preference, innate talent, giftedness, hearing and myriad other considerations abound. But whatever we may think or feel about our relationship to music, it is important to understand that both sound and music play an integral role in the way that we experience the world.

We have not formed our opinions of sound and music consciously. There is growing evidence supporting the theory that an evolving genetic code has shaped our brains to understand music in a fashion not unlike the one that thousands of years ago molded our brains to create language. In fact, music and language centers in the brain are separate yet symmetrically oriented. The right-brain secondary auditory cortex analyzes simultaneous sounds, it deciphers harmonic relations, enjoys the richness of multiple overtones, and is the perceiver of melodic contour. (It is interesting to note that most infants can detect minute shifts in musical pitch in their fifth month, and three months later can remember a melody with such precision that a slight alteration of a single note will create a sign of surprise or displeasure.) This same right auditory cortex analyzes the highly harmonic vowel sounds of language.

The secondary auditory cortex of the left hemisphere focuses on the relationships between successive sounds and, because of its designated job of temporal sequencing, serves as the repository for rhythm. Displaying perfect alignment, the left-brain is also the seat of language, the place where the brain processes networks of ideas into chains of words. In brief, the fact that the right-brain region for notes and musical passages corresponds to the left-brain region for letters and words demonstrates how a neural mechanism present in each of the two brain hemispheres becomes specifically adapted for similar purposes, yet with diverse information or contents.

Sound also functions in our lives in a way that few people consider. Our brains do not have sensors for time as they do for light and sound. Since our concept of time is a measuring of autonomously detected stimuli mixed within a context of short- and long-term memory, the brain really has nothing to sense. Instead, the psychological understanding of time is a creation of our nervous system registering its own relationship with the world—a sense of feeling what is happening to ourselves. Since sound and especially music is a temporal unfolding of physical events, it is sensed as having motion.

While experiencing ourselves in the world—in motion—another element must be considered: emotion. Most people listen to different types of music at different times because of the different emotions that the music elicits. Each incoming piece of music contains components of information—pitch, melody, rhythm, timbre (sound quality), amplitude and location—which is processed separately. The parts are then reunited and reassembled, but now they are charged with whatever emotional response the listener has attached to it. With very few exceptions, people can tell whether a piece makes them happy or sad. For this we can thank our limbic system (or mammalian brain)—that part of the brain that governs pain and pleasure, including sex, eating, fighting or fleeing.

In a person with AD/HD, the limbic system is working normally but the cortical areas which focus attention, control impulses and integrate stimuli have yet to become fully active. PET (positron emission tomography) scans and fMRI (functional magnetic resonance imaging) techniques reveal an interesting phenomenon: the brains of children with AD/HD show a remarkable lack of activity in at least two right hemisphere regions (remember that the right hemisphere perceives melodies and harmonies, bathes in the lushness of rich overtones and analyzes the vowel sounds of language). They include the anterior cingulate cortex (an area associated with fixing attention on a given stimulus) and the prefrontal cortex (a place where impulses are controlled and one plans actions). Research also shows that children with AD/HD often have an area in their upper auditory cortex, which has also been found to be hypoactive. This region is thought to coordinate stimuli from several different sources and presents us with another possibility: the lack of activity in this area of the auditory cortex prevents the AD/HD child or adult from experiencing the macrocosm of his world. Instead of integration, the AD/HD-affected person experiences a fragmented world, unable to discriminate between incoming stimuli.

So what musical prescription might be written for you or your child? Here are a few suggestions: High pitches (within reason) feed the brain; low pitches dispirit it. Listen to music with instruments or voices that spin pleasing overtones (flutes, violins, acoustic guitars, pianos and some singers) in any style that attracts you.

85 percent of our primary auditory cortex (where all sound is initially processed) exhibits a phenomenon known as "habituation." Any unrelenting sound causes us to deafen to it (notice how your attention is drawn to the cessation of sound from a noisy refrigerator or the times when crickets abruptly stop their chanting). Since the brain craves change, listen to music that contains alterations of rhythm, volume and pitch.

Sing whenever and wherever possible. Sing to your children and have them sing back to you. Teach them to sing while they read, sing while they play, sing in the bathtub and while they ride their bicycles. Encourage them to use their voices and to listen to those voices, for they can be healing themselves at every moment.

Avoid listening to extremely fast music, especially if it is correspondingly loud and insistent.

Much has been said about the music of Mozart and its effect on listeners. Some of it is true. But many other composers provoke the same curative benefits, from the Beatles to Duke Ellington's orchestra to Ravi Shankar, Ravel and Debussy, the rags of Scott Joplin, Gershwin and Berlin songs, and the electronic possibilities of the Moog synthesizer. Don't limit your choices by listening to other people's prejudices; find your own sound and then expand upon it.

Music generates emotion, so be intentional about your options. Do you want to reinforce, deepen or prolong a current emotion? Or might it be healthier to shift sounds and possibly shift emotions? Excellent and affordable home listening programs are available to enhance concentration, spawn new neural pathways, and promote both relaxation and aural learning. The best of these was created by a group centered at the National Academy for Child Development, a clinic that has been treating children and adolescents with neurological disabilities for over 30 years. Visit Advanced Brain Technologies at [www.advancedbrain.com](http://www.advancedbrain.com), contact them at 801-622-5676 or write to ABT at P.O. Box 1088, Ogden, UT 84401.

Well-crafted music written by trained composers and performed by artists allows your brain to be drawn to the intensity of contrast, anticipation, withholding, satisfaction and release. Skip the junk and stick with the pros.

Remembering that our brains process every sound within our range of hearing, avoid music that approaches or exceeds uncomfortable decibel limits (this is good advice for all living creatures).

It has been medically proven that music can affect physiological parameters like blood pressure, heart rate, salivation, skin humidity, blood levels of stress hormones, sleeplessness or wakefulness. Decide whether you want to experience these changes in body function by monitoring your feelings carefully, and then choose music that agrees with your body.

Earphones may focus attention on the music being listened to, but it also separates the listener from his/her environment. Decide why you may want to withdraw from your milieu before escaping it.

Ounce for ounce, brain tissue is the third most consumptive of energy in the entire body (after the heart and the kidneys). The average human brain burns 22 percent of your total caloric intake. A healthy diet of music and food can boost energy levels, improve self-esteem, balance emotions and amplify personal attraction, with all of these factors existing while your body assumes a more vital look. Music is truly food for thought.

Use music the way Michelangelo used his chisel on a piece of marble: rather than carving the stone to shape a figure, he simply freed the perfect form that already resided within the stone. Dawna Markova eloquently expresses this concept of the perfection contained within all of us:

They say a child is born a blank shape to be molded, a tabula rasa to be written upon. But children come like a plant with a rhizome - its food source, the genetic coding for what flower it will become, how often it will bear fruit, what its artistry is; all of that born into it with the seed. The role of the gardener, then, is simply to discern the manner of plant or child trying to emerge. The role of the gardener, or parent then, is simply to ask, "How do I help it grow into what it is in its roots?"

Mindful music and sound facilitate the growing of healthier brains, and both can be used to heal scars that have appeared during the course of our lifetimes. Music cannot cure AD/HD, nor can residential treatment programs, psychopharmacological concoctions, biofeedback, acupuncture, behavior modification or a host of avowed curatives. Many of us hope, work and pray for a time when a procedure or a chemical or a preventive measure will be uncovered, a tonic which will bring greater relief to the millions of children, adolescents and adults whose lives are altered by this disruptive disorder. In the interim-as the neurologists, chemists, geneticists, psychiatrists and cytologists search through micro space probing for clues-simply push the button on your CD player and set a bit of healing into motion. Or howl at the moon.

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