THE SCIENCE OF SOUND AND HEALING
By Stephen Kaplan

Throughout time and across all cultures, music and sound have been an integral part of ceremony and ritual and have played a significant role in the healing of humankind. In every cosmology and mythology, sound is a major link, the carrier wave between the world of spirit and the people of Earth.

The Australian aboriginal cultures believe the Earth was sounded into existence through the didgeridoo. For centuries shamans have used drums, rattles and chanting as an integral part of healing practices in indigenous cultures. Their music often triggered their own trances, dreams and visions through which they assisted community members to heal. Healing mantras, chants and incantations are seen throughout history and in every major world culture – Hindu, Moslem, Jewish, Native American, Polynesian, Asian, Sufi, etc.

In ancient Greece, Apollo was both the god of music and medicine. Ancient Greeks said, "Music is an art imbued with power to penetrate into the very depths of the soul." In the mystery schools of Egypt and Greece, healing and sound were considered a highly developed sacred science.

Today, music and sound continue to be significant tools for healing. Increasingly, healing practices employing sound and music, once validated only by custom or anecdotal support, are being confirmed by findings from a wide variety of scientific studies. New findings suggest that music can stimulate complex cognitive, affective and sensorimotor processes in the brain, whose functions can be generalized and transferred to therapeutic purposes.

This article provides an overview of scientific studies that (1) reveal how sound impacts the brain and (2) demonstrate the healing powers of practices employing sound and music.

HOW THE BRAIN PROCESSES MUSIC

Researchers around the world have spent more than five decades studying how the brain processes music. Their research shows physiological links between melody and the mind, a connection far greater than we ever

imagined. “We’re discovering music is really a complex human behavior,” explains Fred Moreno of the New Academy of Sciences, which published the new ***Biological Foundations of Music***, a collection of scientific papers demonstrating “the dynamism and richness of this emerging discipline” of music and neuroscience.

Scientists say nothing enthralls the brain more than music. In the past, some researchers have believed that there exists some kind of "music center" in the brain. New research suggests quite the opposite. There may be, in fact, unexpected areas of the brain involved in interpreting, writing, feeling, and even performing music. Brain researchers are finding that music, like language, stimulates many areas of the brain involved in other kinds of thinking.

For many years, the right hemisphere has been considered the seat of music appreciation, but brain scans of people listening to music show that music perception is created by an interplay of activity in both sides of the brain. Dr.Mark Jude Tramo of the Harvard Medical School has been studying a small region of the brain critical in having perfect pitch - the ability to recognize by ear the perfect middle C note on the piano. He has discovered that the area also plays an important role in language processing. Tramo concludes there is "no grossly identifiable brain structure that works solely during music cognition.”

Lawrence Parsons at the University of Texas Health Center at San Antonio found that music activates the cerebellum, not just the right side of the cerebral cortex, which already was known to interpret music. His findings run contrary to the long-standing belief that the cerebellum controls only motor skills.

"Music is processed in more regions of the brain than we ever imagined," says Josef Rauschecker, a Georgetown University researcher who studies the auditory processes of the brain. "Music is a great example of how different parts of the brain can act together," and it can have a profound, even physical, effect on the brain. In studies, musicians trained at a young age show a greater area of brain activity when listening to music than do non-musicians. They also may show a more left-brained or analytical response to music. "Musicians devote more brain power to listening to music and may have better abilities in other areas as well," Rauschecker says.

This thesis is supported by recent studies focused on music-making activity like learning to play an instrument or playing in a band. They reveal that these activities have a measurable impact on math, science, reading scores." A joint study by the University of Wisconsin and the University of California, Irvine, found that 3- and 4-year-olds who were taught to play the piano scored 34% higher on the abstract reasoning skills used in science and math than did children who were taught to use computers.

Perhaps most graphic of all is the recent discovery by Gottfried Schlaug at Beth Israel Deaconess Medical Center in Boston that music may actually affect brain size. When he compared the brain scans of thirty musicians with those of a group of thirty non-musicians, he found that the corpus callosum, the thick cable of neurons connecting the brain's right and left hemispheres, was larger among the musicians. The trend is even more pronounced for musicians who took up an instrument at an early age.

These studies clearly indicate that listening to and playing music can actually alter how our brains, and thus our bodies, function. Doctors are just starting to apply these revelations to treating patients. Music therapy is being used to affect physiological changes such as lowering of blood pressure, heart rate and muscle tension. Music is also used to increase the immune function and decrease ACTH (stress) hormones. Doctors believe music therapy in hospitals and nursing homes not only make people feel better, but also make them heal faster.

Recent studies on psycho-immunology reveal that nerve fibers contained in every organ of the immune system provide biological communication between the nerve endings and the immune system. This suggests there is a direct link between a person thoughts, attitudes, perceptions, and emotions, and the health of the immune system. This being the case, we potentially have the ability to be proactive in the health of our bodies and minds. (Goldman & Gurin) Using music therapeutically is one of the key ways of being proactive in promoting self-healing.

MUSIC THERAPY AND NEUROLOGICAL REHABILITATION

Some of the most promising findings in music therapy research show how music can help Parkinson’s disease and stroke patients regain limb movement. Dr.Michael Thaut of Colorado State University, one of the nation’s leading researchers in neurological rehabilitation, believes this new

research will also prove that music is also useful in retraining a person’s attention and memory.

Thaut composes and plays original compositions with a specific beat to help victims of stroke, cerebral palsy and Parkinson's disease recover body functions. He and his colleagues observe patients in physical therapy, then compose music tailored to their movements. Speed, symmetry and muscle activity improve faster when the sounds are synchronized to individuals' gait patterns. In a recent study, Thaut's team detailed how patients who walked to music took bigger, more balanced strides than those whose therapy had no accompaniment.

MUSIC AND SLEEP DISCORDERS

A new study of people with Alzheimer's disease found that music helped them sleep better. When the patients played drums or sang along with songs, their serum melatonin levels -- which influence how well we sleep -- skyrocketed by more than 200%. "Through music, they slept better, interacted better with others," says Mahendra Kumar of the University of Miami, one of the researchers. "For the first time, we've been able to measure music's impact."

SOUND AND CANCER TREATMENT

Strengthening the Immune System

Researchers from the Mind-Body Wellness Center in Meadville, Pa., reported the results of an experiment in which 111 cancer patients played drums for 30 minutes a day. They found strengthened immune systems and increased levels of cancer-fighting cells in many of the patients.

Use of Sound to Destroy Cancer Cells

Pioneering research by Fabien Maman, a French composer and bio-energeticist, documents the influence of sound waves on the cells of the body. In a year-and-a-half study conducted with Helene Grimal, an ex-nun who became a drummer, Maman studied the effect of low volume sound (30-40 decibels) on human cells.

Maman and Grimal mounted a camera on a microscope where they had placed slides of human uterine cancer cells. They proceeded to play various acoustical instruments (guitar, gong, and xylophone as well as voice) for periods of twenty minute duration while they observed the affect on the cells.

They found, for example, that when a xylophone was used over a period of fourteen minutes playing the Ionian Scale (nine musical notes C-D-E-F-G-A-B-and C and D from the next octave above), the structure of the cell quickly disorganized. In other words, fourteen minutes was enough time to explode the cell when the nine frequencies were used.

The most dramatic influence on the cells came from the human voice when it sang the same scale into the cells. In this experiment, the cancer cells experienced a total explosion within nine minutes. According to Maman, "The human voice carries something in its vibration that makes it more powerful than any musical instrument: consciousness. . . ."

Maman's findings in the laboratory led him to continue his study by working with two breast cancer patients. Each woman committed to tone for three-and-half hours per day over a period of a month. In one case, the tumor vanished completely. The second woman underwent surgery to remove the tumor. Her surgeon reported that the tumor had reduced in size considerably and had literally dried up. The surgery was successful, and she made a complete recovery. Maman concludes, "the cancer cells show evidence of cell nuclei incapable of maintaining their structure as the sound wave frequencies attack the cytoplasmic and nuclear membranes." The cells die because they are not able to accommodate their structures and synchronize with the collection of sound. They cannot live in an atmosphere of dissonance, and they cannot become resonant with the body. In short, the tumor cells destabilize, disorganize, disintegrate, explode and are ultimately destroyed in the presence of pure sound.

Ultrasound cancer treatment

An interesting article from Reuters on the use of ultrasound in cancer treatment presents findings which parallel those in the research by Maman reported above.

Scientists at a Northern Ireland biotech company have developed a new non-invasive technique that can destroy cancer cells in mice. Instead of surgery, drugs or radiation treatment, researchers at Gendel used an electric field and ultrasound to kill cancerous cells in the laboratory, as well as in the tumors of 50 mice, as reported in ***New Scientist*** magazine.
Although it is in early stages of development, the company believes the technique could one day be used to treat head and neck tumors and hopes to begin human trials in two years.

"The technique relies on the application of an electric field to a tumor to make it susceptible to a follow-up blast of ultrasound," according to ***New Scientist***. "The combination appears to cause tumor cells to self-destruct."

The new procedure is based on a drug delivery technique which involves transporting drugs to hard-to-reach areas of the body by using the patient's own red blood cells. The blood cells are sensitized outside the body with the electric field, which makes them permeable, and then filled with a drug and put back into the patient. Ultrasound is directed to the tumor site and the cells with the drug burst open, putting the drug exactly where it is needed.

The ultrasound fields used in the cancer treatment are stronger than those used to monitor the growth of babies in the womb and are similar to the strength applied to muscles in sports medicine.

Gendel scientists admitted they do not know why the cells rupture when hit by ultrasound. Furthermore, they point out that some cancer treatments that have worked in animals have not been successful in humans.

Although the ultrasound treatment is in early stages of development, the company believes the technique could one day be used to treat head and neck tumors and hopes to begin human trials in two years.

MUSIC THERAPIES

There are many applications of music therapy in our everyday lives and the fields of treatment are very broad, encompassing psycho-therapeutic, educational, instructional, behavioral, pastoral, supervisory, healing, recreational, activity, and interrelated arts applications.

Barbara Crowe, past president of the National Association of Music Therapy, suggests music and rhythm create their healing effects by calming the constant chatter of the left brain. "A loud repetitive sound sends a constant signal to the cortex, masking input from other senses like vision, touch, and smell," she explains. When sensory input is decreased, the normally noisy left brain with its internal conversations, analyses, and logical judgments subsides to a murmur, stimulating deeper parts of the brain that are throne-rooms of symbols, visualization, and emotions. "This is the seat of ritual in tribal societies," she observes. "There is a clear, distinct parallel between traditional shamanism and the practices we do in music therapy today."

Raymond Bahr, Director of Coronary Care at St. Agnes Hospital, Baltimore, Maryland contends, "Without a doubt, music therapy ranks high on the list of modern day management of critical care patients…Its relaxing properties enable patients to get well faster by allowing them to accept their condition and treatment without excessive anxiety."

(1)Music for Entrainment

Entrainment is a powerful tool in behavior modification. In effect, the principle of entrainment directly relates to the Greek word isomorphic (commonly referred to as the iso principle). Isomorphic means same form or appearance. Therefore, musical entrainment is actually a process of joining with feelings conveyed in the music and sensing the feeling of commonality with it. One might almost have an experience of feeling a connection with the composer or performer by sharing emotions and feelings conveyed in the music, either through its creation or through the performance itself. Music in this sense can be a powerful tool in both positive and negative ways to the listener.

Music entrainment is more than just a tool to be used for behavior modification. Music has the power to integrate the whole, person allowing profound healing on many levels. Music is one of the few experiences that can touch a person on all levels of consciousness. It is a powerful sensory stimulus that can work simultaneously on the body, mind, and spirit. Entraining the body with music can have a transformative affect on an individual by moving the music through the body systems and bringing about harmony. Through the use of music, positive affects have been seen in the nervous system, affecting the endocrine system, which in turn enhances the immune system.

(2)Music for Diversion

Using music and sound as diversion is helpful in taking the attention away from an unpleasant or unwanted situation. An example of diversionary music is the playing of bright, happy, energizing music when the listener feels depressed. Music, in this sense, can be used in a therapeutic situation to reduce anxiety and pain, temporarily transporting the listener to another reality during the healing process.

The International Association of Pain has defined pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage." In more esoteric terms, pain is a symptom of disharmony. Pain can be viewed as a series of vibrations that send messages to the brain indicating a disharmony in some part of the body. Think of this vibration as an alarm sounding to warn of a problem in the body. The mind and body can be re-programmed or harmonized to a place of harmony and healing by entraining it with music.

(3)Music as Medicine

Music enters into the body through the ear, and the bones of the body act like a tuning fork. The neurological fields of the body are then stimulated by music. Music is a means by which all people can feel these healing vibrations. Even people with profound handicaps can benefit from music's healing effects. Research in physiological responses to music supports the hypothesis that listening to music influences a person's autonomic responses. Science has proven that music focused in the higher registers increases tension. Conversely, music played in the lower registers reduces tension. Music that is played at a tempo of 80-90 beats per minute increases tension, while music at played at 40-60 beats per minute decreases tension.

When music is used as medicine it is used in a way that directly affects the health of the patient. An example is the use of music in "audio-analgesia." Music is used in this way to alleviate or lessen pain, and can be used, at times, in lieu of pain medications. When used in this way, it is a necessary component in affecting the outcome of the treatment.

Another benefit of "healing" music is to stir our emotions and feelings, to help us deal with grief, sadness, anger or other feelings. By allowing

ourselves to really experience the feelings, the intensity will eventually lessen and even dissipate, resulting in healing. When we avoid our feelings (consciously or unconsciously) they tend to build up inside. They don't just go away. Music and sound are wonderful tools for helping us to deal with feelings within us, whether we're aware of them or not.

Written for Sera Soma http://www.sera-soma.com