Music and Medicine

by

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Marguerite Thal was a highly skilled and exceedingly accomplished, classically-trained keyboard player. She had earned her Master's degree in Music Performance from the University of Michigan and had studied the organ in Paris with noted teachers Jean Langlais and Maurice Durufle. She concertized regularly and also served as the organist at her church in Sylvania, Ohio. She was a bright, outgoing woman with a very active social life. She also happened to be my mother-in-law.

Then, early in her sixth decade of life, words began to fail her. Her family began to notice that she was participating less often and less meaningfully in family discussions. She had trouble formulating answers to questions and began avoiding participation in the game nights that her family frequently enjoyed. She was less and less able to perform household duties and to care for herself. Friends began to notice the difference that was overtaking Marguerite, too. The family doctor was consulted, and soon specialists were called in, including a neurologist who administered a battery of tests. Before long, the diagnosis came back: primary progressive aphasia. Marguerite had acquired a form of dementia that was slowly robbing her of her ability to communicate and would, like most dementias, eventually result in her complete debility.

As the disease progressed, Marguerite continued practicing and performing on both the piano and organ. Even as it became virtually impossible for her to carry on meaningful conversations, she was performing concerts of demanding organ music and wowing the audiences with her proficiency. After several years of slow deterioration, Marguerite was institutionalized in a facility that specialized in the care and treatment of patients with various forms of dementia. Through the intervention of her husband, Norm, an upright piano was moved into her unit, and Marguerite was able to lead hymns during Sunday morning church services in the unit and to occasionally lead sing-alongs for the residents. Even though Marguerite could not carry on a simple conversation, the words to many familiar songs were still available to her and she could sing them without hesitation.

Late in the progression of her disease, about a year before she died, Betsy and I, our children, and Norm visited Marguerite at the center where she lived. By that time, we were not absolutely certain that she even knew who we were. She was napping most of the time and was not easily aroused. Still, when Norm invited her to play a little piano for us, she allowed herself to be led down the hall to the upright, where she executed a nearly note-perfect rendition of a Bach prelude. She then arose, shuffled off down the hall to her room, and went back to bed.

My purpose for recounting this story is to illustrate a principle that is at the heart of the topic of my paper today. Even as many of our faculties decline or are taken from us through disease, trauma, or the ravages of time, music has the remarkable ability to reach through the mental fog and past the physical barriers to touch our minds and, indeed, our bodies in ways that little else can. For this reason, music has a great deal of promise as a therapeutic tool in the treatment of many pathological conditions.

Even back to the time of the ancient Greeks and before, a relationship between music and healing was noted. The Ancients recognized that certain sensory inputs – in this instance, music – elicited strong physiological responses. Because there was no other obvious explanation for this phenomenon, it was attributed to the gods, and it was believed that through Apollo, the god of healing and of music, cures could be effected for such maladies as gout, epilepsy, and snake bite. In the 17th century, theories of the healing power of music revolved around the "humoral spirits" – blood, phlegm, black bile, and yellow bile – and the ability of music, by producing vibrations in the air which moved these spirits within the body, to influence the health and temperament of the afflicted. A century later, the various fibers in the body – muscles, nerves, and arteries – were believed to vibrate sympathetically, as the strings on a violin, when the appropriate musical tone was played. Some believed that these fibers, if they became inharmonious, "could be retuned by music."

One of the more interesting historical uses of music as medicine can be found in the tradition of tarantism, from which we get the folk dance form known as the *tarantella*. In the 16th and 17th centuries reports emerged from certain areas of Italy and Spain – most notably the region around Apulia, which forms the boot-heel of the Italian peninsula – of individuals falling into "a stupor from which only music could arouse them." The bite of the tarantula was generally blamed for the condition, although many of the victims bore no bite marks, and spider bites in other geographic locations were known to produce no such grave consequences.

> Musicians wandered in the summer from village to village, playing for the "tarantati." Each patient was affected by only a particular song and the musician might try several on different instruments; lute, guitar, violin, flute, and percussion were all used. . . . There seems to have been no invariable meter or key; some [songs] were sung, others purely instrumental. Their common characteristic was speed and repetition. Short phrases were played over and over with ever increasing tempo as the stricken ones, roused from their stupor, whirled and jumped in a frenzied dance. The dancers made erotic gestures, waved swords in the air, or tore branches from trees. Bright colors attracted them and they were repelled by black. The sound and sight of water pleased them. The dancing continued for several days, after which the patients appeared to be healed. But for several years, whenever they heard the brisk strains of the tarantella, they again felt compelled to dance. (National Library of Medicine, n.d.).

Opinions varied on the physiology of the cure thus produced. Some said the dancers expelled the venom through their pores as they perspired. Others believed that the blood of the victims, coagulated by the spiders' venom, was "set in motion" by the music and dancing. Still others hypothesized that the phenomenon represented a form of melancholia which was relieved by the music. Most contemporary researchers, however, view tarantism as a cultural or psychological phenomenon.

Later, in the 19th century, a more scientific and rational approach to describing the effects of music was developed. The great German scientist, Hermann von Helmholtz, known for his investigation and description of the physics and physiology of music, was able to describe what makes up a musical tone and how humans perceive music as consonant or dissonant. The 1800s also saw the first scientific investigations into how various elements of music, such as rhythm, pitch, and volume, affect physiological responses as measured through such indicators as blood pressure, heart rate, and respiration. (Patton, 2010).

So how, indeed, does music affect the human body? Are there mysterious influences that music has on the body's fluids and structures that explain our responses to it? Or does the rapture we feel from hearing the "Hallelujah Chorus," the melancholy brought on by Barber's "Adagio," or the elation stimulated by a Sousa march have a more rational and scientific explanation? More to the point, does music possess therapeutic properties that can be understood in medical or scientific terms?

Suzanne B. Hanser, the author of *The New Music Therapist's Handbook,* believes that the effects of music are neither magical nor unexplainable. She states, "The constituents of a response to music may be isolated, and it is possible to establish a cause and effect relationship between music and behavior. The effects of the 'art' of music are, thus, substantiated through scientific methodology" (Hanser, 1999, p. 2). In other words, it is reasonable to look for objective, measurable physiological responses to music. Studies published in two advanced nursing journals (Good et al., 2001; Heitz et al., 1992), for example, describe how pitch and tempo act on the autonomic nervous system – the part of the peripheral nervous system that largely functions independent of conscious control -- and produce measurable physiological effects. These researchers report that low pitch and tempo at the rate of 70-80 beats per minute cause measureable relaxation, whereas high pitch and faster tempo produce tension. *Harvard Men's Health Watch* reports that "Low tones played on stringed instruments at a tempo of about 60 beats per minute appear most successful" in bringing about relaxation. The variety of ways in which music physically affects the human body is too vast to be covered comprehensively in a paper of this scope. However, I'll mention just a few.

Perhaps the most noticeable and most easily measurable indicators of music's effects are physiological stress parameters. These are the measurements that can be readily taken which indicate relative stress or relaxation. Heart rate, for instance, seems to be affected by music, and the effect seems to depend upon the type of music being heard. A musical piece or passage which has significant emotional meaning for the listener is likely to cause an increase in heart rate. Multiple sources consulted for this paper recount an experiment conducted on the famous Austrian conductor, Herbert von Karajan, long-time music director for the Berlin Philharmonic. Von Karajan was hooked up to a heart monitor while he conducted a performance of Beethoven's Overture, Leonora #3. During the performance, his heart rate was seen to increase dramatically during certain passages. Later it was noted that these passages were not the ones which required the greatest physical effort, but rather the ones which were most emotionally moving to the conductor. In an even more interesting extension of that experiment, von

Karajan's heart rate was also monitored when he was given the opportunity to pilot and land a jet aircraft. During this latter experience, the conductor's heart rate fluctuated less than it did while conducting the Overture (Storr, 1992).

Electroencephalograms (EEG) – tracings of the electrical activity in the brain – can also provide a graphic depiction of the effects of music on the human body. Oliver Sacks (1990), the noted neurologist and psychologist, in his popular book, *Awakenings*, describes the case of two highly musical Parkinson's disease patients who exhibited "grossly abnormal EEGs, with stuporous and convulsive physical aspects." Sacks reports that the EEGs of these patients, as well as their physical behavior, became entirely normal when they were playing or listening to music. A 1998 study printed in the journal, *Adolescence,* reports that EEG measurements of brain wave activity in a group of chronically depressed adolescents showed that EEG activity in the right frontal lobes of the brain, typically associated with negative emotional affect such as depression, was significantly reduced while the subjects were listening to both rock and classical music, signaling a positive effect on the mood of these subjects.

The effect of music – at least, the correct type of music – can have a measurable effect on blood flow, as well. Dr. Michael Miller, Director of the Center for Preventive Cardiology at the University of Maryland Medical Center, conducted a study in which blood flow through the brachial artery was measured as a group of healthy subjects listened to music – first, music which the subjects described as making them feel "joyful," then to music which they described as making them "anxious." The results were striking: blood flow during the period when the joyful music was being played increased dramatically, while arterial flow during the anxiety-producing music was decreased. Most interesting was the fact that the increases in blood flow measured during the joyful music was equal to that which these subjects experienced during a period of aerobic exercise (Schwartz, 2008).

Music can certainly be arousing, often producing such measurable physiological responses as pupillary dilation, increased respiratory rate, increased blood pressure and pulse, increased muscle tone, and changes in amplitude and frequency of brain waves on EEG – in other words, all the preparations for a "fight or flight" response. Many brain scientists insist that sound, including music, produces much more intense reactions in us than any other sense, and other researchers have suggested that we literally never stop hearing, even when we are unconscious. Dr. Mitchell Gaynor (1999), a cardiologist and proponent of many uses of music as a therapeutic tool, claims that hearing is essentially unaffected by anesthesia. Furthermore, it is a commonly accepted maxim among health care professionals that hearing is the last sense to be lost as a person dies. Music has a direct and nearly inescapable influence on how we feel and how we behave, an influence that is often remarkable when a person is emotionally involved with the music.

The insistent and motivating nature of music has historically made it useful to us in many practical ways. For example, psychologist Anthony Storr, in his book, *Music and the Mind* (1992), reminds us that music has long been used as an accompaniment to work, especially tedious, difficult tasks such as those performed by chain gangs and 19th century railroad crews, because music tends to affect people emotionally in a positive way and because music structures time and provides a natural rhythm to our activities. Music also serves the function of significantly enhancing other elements of our sensory experience. Consider, for example, the long tradition of using music in conjunction with other art forms that are primarily visual, most notably film. Many of the most moving moments in film history would probably have had little impact on audiences if not accompanied by their musical scores. The sight of the shark's fin moving through the water in *Jaws* is not nearly so ominous, nor is the image of the death star hurtling through space in *Star Wars* nearly so impressive as when accompanied by the evocative musical scores written for those scenes. In his book, *The Music Effect: Music Physiology and Clinical Applications,* Daniel J. Schneck, a concert violinist and a fellow of the American Institute for Medical and Biological Engineering, states, "Music 'speaks' to the body in ways that do not require translation or interpretation. The communication channel is direct. Music causes response without need for semantic interpretation" (Schneck & Berger, 2006, p. 24). It is for this reason that many of us are unconsciously compelled to tap our foot or otherwise move our bodies in time to certain passages of music.

But this is not to suggest that music is always excitatory. Indeed, as William Congreve noted in his poem, "The Mourning Bride," "Musick has Charms to sooth a savage Breast." The literature is full of research reports that highlight the soothing effects of music. Not surprisingly, whether music excites or soothes seems to depend, at least in part, on the type of music being heard. A study conducted in 2005 by British and Italian researchers involved a group of trained musicians who were fitted with headphones, hooked up to monitoring equipment, and exposed to a variety of styles of music, ranging from rap to classical. Researchers found that heart rates and breathing rates increased during the periods of the livelier music, and when the music slowed, so did the physiological measures. The researchers also found that it did not seem to matter whether the subjects liked the music or not: the effects were related directly to the inherent characteristics of the music.

Not every type of music has a salutary effect on the condition it is meant to relieve. For Oliver Sacks' Parkinson's disease patients, a positive result was only possible if one utilized the “right” kind of music. One of Sacks’ patients, a Mrs. Frances D., responded only to music that was legato, a musical term that refers to musical notes that are played or sung smoothly andthat are connected, with no intervening silence between notes. Sacks describes the effect of such music on his subject:

> One minute I would see her compressed, clenched, and blocked, or else jerking, ticcing, and jabbering. . . . The next minute, if we played [legato] music for her, all of these explosive-obstructive phenomena would disappear, replaced by a blissful ease and flow of movement as Mrs. D . . . would smilingly “conduct” the music, or rise and dance to it. (Sacks, 2007).

On the other hand, staccato, percussive music caused this same patient to jump and jerk helplessly to the beat of the music, “like a mechanical doll or marionette” (Sacks, 1990, p. 60).

Besides inducing relaxation or stimulating and coordinating movement, there are many other ways in which music has been shown to improve human health. Here are some examples:

A study published in the spring, 2002 edition of the *Journal of Music Therapy* demonstrates that a 30 minute session of active music participation – including either singing or playing a musical instrument – results in a significant increase in salivary levels of immunoglobulin A, an antibody that plays a critical role in mucosal immunity. This finding suggests that such musical activity boosts the immune system and helps protect against many microbes that thrive in body secretions. Also noteworthy in this study was the finding that merely listening to music for 30 minutes also increases this antibody, though to a lesser extent.

In 2008, the journal, *Brain*, reported on a study of patients who had suffered neural damage as a result of stoke in one of their middle cerebral arteries. Over a two-month period, a group of these patients listened daily to self-selected music, along with their standard care and rehabilitation. A control group received only the standard care. As a result, the music listeners showed dramatically better recovery in the areas of verbal memory and focused attention than the control group. In addition, the music listeners were also less depressed and confused than the control group. This study presents convincing evidence that music listening during the early post-stroke period can enhance cognitive recovery and prevent negative mood.

The *European Journal of Anesthesiology* reports on a randomized, controlled trial in which a group of patients undergoing open hernia repair were exposed to music during their procedures while under anesthesia and postoperatively. As compared to the control group, which experienced silence throughout the course of their procedure, the patients exposed to the music reported significantly lower levels of pain, required the use of significantly smaller amounts of morphine for pain control, and had significantly lower levels of serum cortisol (a stress hormone), suggesting that intraoperative and postoperative music therapy can significantly reduce pain and the need for narcotic therapy.

One local research study would appear to support the findings just described. A study conducted at Parkview Hospital in 1994 by two local researchers, one a registered nurse and the other a music therapist, sought to examine the usefulness of music in inducing relaxation in patients about to undergo the removal of an arterial sheath placed for use during coronary angioplasty. The standard procedure at that time was to use Demerol, a narcotic medication, to induce relaxation. Some patients in the study were given relaxing music tapes to listen to before the procedure in lieu of the medication. The study found that the music tapes were equally effective in inducing relaxation, allowed most patients to tolerate the procedure well, and, naturally, resulted in fewer drug-related adverse effects. As a result, the use of music in inducing relaxation in these patients was adopted by the hospital as an ongoing standard of care (Itt & Romero, 1994).

These examples are taken from a literature of literally thousands of research reports that show dramatic results from the therapeutic use of music in treating such conditions as Parkinson's disease, stroke, age-related dementia and Alzheimer's, traumatic brain injury, chronic pain, cerebral palsy, depression and anxiety, and more.

Among the conditions for which music has been most successfully used as a therapeutic tool is aphasia, or the inability to produce or understand language, and stroke. Let's take a look at these two conditions and some of the musical approaches to their treatment.

The ability to produce language and to understand language involves an extremely complex neurological process; and aphasia, a disruption in this neurological process, affects millions of people in its primary form, such as that which afflicted my mother-in-law, or when it occurs secondary to another process, such as stroke, Alzheimer's disease, traumatic brain injury, etc. The language centers of the brain reside in the dominant hemisphere, the left brain for most of us. In the cerebral cortex on the left side of the brain lie two distinct regions – Broca's area (named after French anatomist Pierre Paul Broca) and Wernicke's area (after German neurologist Carl Wernicke). Simply stated, Broca's area houses the neurons involved in the production of speech, mainly the control of the muscles involved in the uttering of words. In Wernicke's area we find the neurons that allow us to comprehend the words that we hear and read. Damage to either of these regions of the brain produces dysfunction in the ability to communicate. As with all forms of neurological injury, the damage to the brain's speech centers is extremely difficult, if not impossible, to repair.

However, the brain is an extremely plastic organ. That is to say, the brain has the remarkable ability to reorganize the neural pathways that determine how the brain functions and what certain groups of neurons can do. While it is not possible to grow new brain cells, the existing cells can change in the ways in which they communicate with one another. This plasticity is a common phenomenon during fetal brain development and during our early years, when the brain is creating the neural connections that will characterize it throughout its lifetime. However, reorganizing the neural pathways in the mature brain is a different matter. Still, neurologists now recognize that the brain can "re-map" itself through changes in neuronal structure and in the number of synapses between neurons. This re-mapping is largely experience-dependent and involves the brain assigning new duties to existing, functional areas of the brain.

So how does music play a part in reestablishing a person's ability to speak fluently? As we know from the story of Marguerite Thal, many individuals with dysfunction in the language centers of the brain are still functional musically: they can sing, play instruments, and so forth. Interestingly enough, in people with expressive aphasia (the inability to produce language), three linguistic functions tend to remain intact: the ability to recite familiar phrases, the ability to use profanity, and the ability to sing. The reason for the persistence of these functions is that they are largely right brain functions, meaning they are less likely to be harmed in the case of left brain injury, unless the damage is very widespread. In addition, the neural circuitry for singing and swearing is more diffusely located in the right brain – that is, it is spread out over a larger area of the cerebral cortex – as opposed to the focused circuitry associated with Broca's area in the left brain, a characteristic which makes singing a more difficult activity to disrupt.

Because the two hemispheres of the brain are interconnected and in constant communication, it is possible to enlist right-brain circuitry to adopt the functions which are normally left-brain. As a matter of fact, the suprasegmental elements of language, such as stress, rhythm, intonation, pitch, and voice quality, already reside primarily in the right hemisphere. The trick is to get the right brain to cooperate in restructuring the necessary circuits. Several formal techniques exist for facilitating the recreation of language skills using music. The most highly regarded of these among music therapists is a technique called melodic intonation therapy, or MIT.

MIT was developed in 1973 by three researchers working with post-stroke aphasic patients at the Veterans' Administration Hospital in Boston. It is a highly structured technique that involves the following steps:

First, the music therapist hums a short phrase using a simple two-tone pattern and the patient taps the rhythm with his/her left hand or foot (remember, we're capitalizing on the intact neural circuits of the right brain). Next, the patient joins the therapist in humming the phrase while continuing to tap rhythm. As the patient becomes more adept at this activity, the therapist sings intoned phrases, adding words to the tune, and the patient repeats them. The next step is the same, except the patient is required to wait a period of time before repeating the phrase, which helps increase the patient's ability to retrieve words. In the final step, the phrases are lengthened and the technique of "sprechgesang" is used to facilitate transition to normal speech. The ultimate goal is to incrementally remove all of the musical elements so that the patient presents normal speech.

This use of sung, or intoned, speech to move an aphasic toward normal speech is only one of the ways in which music can help a patient to relearn spoken language. Other characteristics of music make help make it effective for this purpose in multiple ways. For example, music has the ability to activate the affective circuitry of the brain – that is, the parts of the brain involved in feeling and emotion. By "inviting" another area of the brain to participate in the act of speaking, it is possible to further stimulate brain plasticity and train the brain to use new neural circuits to produce speech. Furthermore, the purely musical components of a song – the melody, harmony, rhythm, etc. – provide a context for words that seems to facilitate word production. In other words, music's effectiveness as a therapy for aphasia is multi-faceted and makes it particularly effective.

Cerebral vascular accidents, or strokes, in addition to having the potential to devastate the speech centers of the brain, can also produce a variety of other debilitating conditions that experimentation has shown can respond to the therapeutic application of music. Among the functional deficits that can be improved through music therapy is impaired gait, which makes it difficult for many stroke victims to walk well, if at all. In addition to decreasing the strength of the muscles used in walking, strokes can also impact the brain's ability to coordinate muscle activity. Music therapy, however, has been shown to be effective in restoring that coordination.

Dr. Michael H. Thaut, a professor of music and neuroscience at Colorado State University and the author of *Rhythm, Music, and the Brain: Scientific Foundations and Clinical Applications,* informs us that rhythm is the "most important organizing element in the structure and language of music" (Thaut, 2008, p. 61). This element may be the key to music's ability to reestablish a rhythmic gait in patients who have lost the ability to coordinate walking movements. According to Professor Thaut, rhythm has a natural "priming effect" that preps the muscles for movement in a coordinated fashion. In addition, auditory rhythm appears to serve as a "pacemaker" in gait training for stroke patients and has proven superior to such techniques as electromyographic feedback, an often-used therapeutic tool for patients with a variety of neuromuscular deficits.

One of the principles at the core of music's effects on movement is that of "entrainment." In the 17^{th} century, Dutch scientist Christian Huygens (hi-guns), while working on the design of the pendulum clock, discovered that two pendulums, when placed in proximity and begun swinging at different rates, will eventually end up swinging at the same rate. This phenomenon has correlates in many disciplines, including biology, physiology, and medicine. In physiology, for example, it has long been known that cardiac muscle cells, specifically those in the sino-atrial node of the heart where each heartbeat is initiated, undergo entrainment. Through this process the electrical frequencies of the several hundreds of thousands of cells in this region of the heart are brought into coordination, thus allowing a coherent electrical impulse to be conducted through the heart.

The use of music as an aid to coordinated walking relies on this principle, as well. In a technique that is remarkably similar to melodic intonation therapy used for speech recovery, stroke patients are encouraged first to listen to music, then to tap their hand or foot to the beat of the music. Then the patients are taught to vocalize any sound – words, humming, whistling – to that same beat. From this point, the patients are assisted in walking to the beat, and then to gradually eliminate any auditory cues as the patient's muscles entrain themselves to the music's tempo, eventually developing an independent rhythm of their own. This process, which may take weeks or months, has shown dramatic improvement in overcoming the gait dysrhythmias caused by stroke or, for that matter, other neuromuscular conditions such as cerebral palsy, Huntington's disease, and traumatic brain injury.

Finally, I'd like to spend just a few minutes discussing the effects of music on Parkinson's disease. Anyone who has read the work of Oliver Sacks is familiar with the dramatic effects that music can have on this debilitating disease.

The term Parkinson's disease, or parkinsonism, refers to a group of distinct disorders, some genetic and some environmentally-caused, marked by tremor, rigidity, slowness of movement, a mask-like facial expression, and, sometimes, in the later stages of the disease, dementia. The disease affects up to a million people in the United States, and it is estimated that as much as 40% of all parkinsonism goes undiagnosed. In simplest terms, Parkinson's is caused by a deficiency of the neurotransmitter dopamine, which results in an imbalance between excitatory and inhibitory impulses in the basal ganglia of the brain. While the condition is incurable, a number of effective pharmacological treatments exist for the symptoms of parkinsonism. The problems with pharmacotherapy are that these drugs all have potentially significant side effects and tend to lose their effectiveness over time. Surgical treatments and deep brain stimulation with implanted electrodes have also proven effective in controlling parkinsonian symptoms, especially tremor. However, these methods are obviously highly invasive. Various forms of physical therapy are also crucial in the treatment of the disease to enhance functionality, and this is where music comes in.

Working with patients who were severely parkinsonian as a result of contracting *encephalitis lethargica*, or "sleeping sickness," Oliver Sacks struggled to find effective treatments for these patients who were essentially dysfunctional as a result of their illness. Eventually, as he recounts in his book, *Awakenings,* Sacks came upon the drug levodopa, a drug which was to dramatically change the lives of his patients and countless thousands of other Parkinson's sufferers. But many of his patients, even before levodopa was available to them, had also had dramatic responses to music. As a matter of fact, Sacks has referred to music as "auditory dopamine" (Sacks, 2007, p. 258). To this day, numerous researchers, many inspired by the writings of Dr. Sacks, are hard at work exploring the possibilities that music holds for treating Parkinson's disease and numerous other devastating conditions.

Interestingly enough, some of that research is occurring here in Fort Wayne. The Fort Wayne Philharmonic, in partnership with IPFW's music therapy program, Sweetwater Sound, and other entities, is currently conducting research into the effects of music on parkinsonian symptoms. Dr. Pam Kelly, a local physician, Philharmonic board member, and member of the research project's steering committee, reports that she was approached by a Philharmonic patron, a gentleman who suffers from Parkinson's disease, who reported to her that he noticed a distinct lessening of his parkinsonian symptoms during and for some time after attending Philharmonic concerts. This information led to the formulation of a steering committee, some investigation into similar research done in Europe and through the Cleveland Clinic, and, eventually, to the implementation of Phase 1 of a multi-phase research project. Phase 1 research involved a series of Freimann Quartet concerts at IPFW's Rinehart Auditorium in front of the members of a local Parkinson's disease support group who completed questionnaires regarding the effects of the music on their symptoms. The data from that research was under analysis at the time of my conversation with Dr. Kelly, but results are expected soon. A second phase of research to analyze the responses of a group of Parkinson's patients to a series of live music performances, videotaped performances, and audiotaped performances produced by Sweetwater Sound is also planned. In addition, performances by Philharmonic ensembles in various units of a local hospital and assessment of the effects of those performances on the hospital's patients are also underway. It will be interesting to see what this cutting-edge research contributes to our understanding of the ways in which music can contribute to the treatment of illness and injury.

The 18th-century German Romantic philosopher Novalis once wrote, “Every disease is a musical problem; every cure is a musical solution.” We have yet to learn how music may contribute to many of the diseases that afflict us. We are nonetheless beginning to understand some of the very real ways in which music can, in ways that go far beyond the mystical and magical, contribute to the treatment of some conditions. I think that it reasonable to believe that further research will show that music will be a valuable tool for those who practice the healing arts as we move through the 21st century and beyond.