VALIDATING MUSIC THERAPY

AND ITS EFFECTIVENESS IN TREATING BRAIN DISORDERS:

THE ROLE OF EMOTIONS IN MUSIC AND IN THERAPY

by

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A Thesis Submitted to the Faculty of

The Dorothy F. Schmidt College of Arts and Letters

in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

Florida Atlantic University

Boca Raton, Florida

December 2008

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This thesis was prepared under the direction of the candidate's thesis advisor, Dr. Keaton, Department of Music, and has been approved by the members of her supervisory committee. It was submitted to the faculty of The Dorothy F. Schmidt College of Arts and Letters and was accepted in partial fulfillment of the requirements for the degree of Master of Arts.

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ABSTRACT

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Institution:	Florida Atlantic University
Thesis Advisor:	Dr. Kenneth Keaton
Degree:	Master of Arts
Year:	2008

The success of the music therapy profession has been well established, though the healing properties of music are not yet fully understood. Clinical observations show the medicinal value of music therapy; however, it is challenging to quantify music's beneficial effects. Examining music therapy's effectiveness in treating neurological disorders can possibly help to better validate this profession. However, music therapy is a multidisciplinary field, and perhaps we must come to a better understanding of how the various disciplines relate to one another. Music has the power to modulate our emotions. Neurological studies involving music therapy might help to uncover the connection between our emotional states and our physical health. To truly understand the success of music therapy, we must further study the role of emotions in the healing process. Future examinations of the emotional factor in music therapy may hold the key to a better understanding of how music affects us.

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Introduction

Rationale for Research

I chose this thesis topic for more personal reasons, in addition to intellectual curiosity. In October of 2000, halfway through finishing my Bachelor of Music degree, I had a serious life-threatening car accident. I fell asleep at the wheel, and awoke having noticed that my car was veering considerably to one side of the interstate. In a panic, I jerked the wheel of my car in the opposite direction, hoping to right the wrong; however, I over-compensated and flipped my car numerous times. I was ejected through the shattered windshield of my four-door Honda civic, and landed in the grass on the shoulder of the road. There were many strange coincidences from the crash scene that may have lead to my survival from such a serious car accident. It is a long involved story, and providing the full details would not serve the needs of this paper. Nonetheless, I will share an interesting anecdote involving my recovery, which I deem relevant to subsequent discussions.

I suffered right-hemispheric traumatic brain injury, with a sub-durral hematoma. When paramedics found me on the side of the interstate, my pupils were "fixed and dilated" as they say, and my chances of survival were slim. I was in a comatose state for twenty-four hours, I was paralyzed on the left side of my body for seven days, I suffered from retrograde amnesia, and I had three brain surgeries over the course of a year. I had to have extensive rehabilitative therapies. I fractured my spine in several places, mostly

in the thoracic area, and worked closely with physical therapists as to prevent further damage to my already existing injuries. I also worked with a speech pathologist, an occupational therapist, and had many hours of neuropsychological testing, once right after the accident and then again six months later.

My main neurosurgeon was a veteran in his field, and was one of the best surgeons in the area. He had performed countless brain surgeries, and worked closely with a team of doctors to help patients suffering from head injuries navigate the rehabilitative process. He said that my 99.999% recovery from such a serious injury was nothing short of a miracle. Some of my colleagues have speculated that both my musical abilities and training may have helped my brain to reorganize after having suffered what seemed at first to be insurmountable brain damage. My medical team had no real answers as to why I recovered as quickly or as well as I did, which proves to me that we have much to learn about brain plasticity.

Twenty-four hours after having suffered traumatic brain injury, I was still in a semi-comatose state. My well-trained team of doctors and therapists attempted to prompt responses from me in order to gauge my progress, if any. They held my hand and asked me to squeeze theirs in return, and though I responded to their questions with the appropriate reaction, I had yet to open my eyes or to speak any words. Knowing that I was a musician, my mother decided she would play one of my favorite CDs in hopes of reaching me with music.

I have no recollection of this day, but much to everyone's surprise I sang the words to the song my mother played for me. Upon hearing the news of this, after having had recovered, I thought it astonishing that I had yet to verbally respond to familiar

voices, to human touch, or to doctors' questions. It seemed as though nothing could reach me, but when listening to a familiar song that I knew and loved, my brain was able to hear, comprehend, remember, and sing the pitches, rhythm, and words correctly. This speaks to the power of music, in its ability to reach those suffering from traumatic brain injury.

Music Therapy is well established as a profession, and its beneficial results are well documented. These results, however, are not well understood. This thesis will examine music therapy in the context of the treatment of brain disorders. Though we may be able to validate the effectiveness of music therapy by examining its successes in treating those with brain illness or injury; can we truly understand the success of this multi-disciplinary field, without further studying the role that emotions play in the healing process?

Description and Purpose of Study

Initially, this thesis examines the current state of the music therapy profession beginning with an explanation of the different aspects of today's music therapy field. It considers the functions of music, its impact on American culture, and aspects of behavior related to music. Furthermore, this thesis explores the foundations of music and healing, and presents a historical background of healing with music, which far predates the current understanding of music therapy as a profession. It describes how past societies used various forms of music therapy to aid in the healing of the sick and injured. With this description are examples of how music performance is used to facilitate healing and foster the recovery process of persons in contemporary society.

The paper addresses the origins of the profession of music therapy, and describes the required curriculum and standards of practice for today's music therapists. It examines what we now know about brain function, including information about particular brain illnesses and injuries, and the specific ways in which neurologists treat these conditions. It explores how the use of music therapy can aid in neurological rehabilitation, and suggests that further brain injury research may help to uncover the mysteries surrounding the effectiveness of music therapy.

The thesis concludes with a review of some of the current aesthetic theories regarding emotion in music, and discusses more abstract avenues of thought concerning how we can hear/feel emotions in or through music. It then suggests that listening to and identifying with music can help to facilitate a healthy emotional state, which can in turn promote mental, emotional and physical health. The goal of this study is to propose a more interdisciplinary approach to music therapy research and practice, in hopes of better understanding how effective music therapy can be in the clinical setting to foster and facilitate the rehabilitation of persons with serious illness and/or injury.

Thesis Statement

How the music therapy profession accomplishes its rehabilitative goals seems to be one of the best kept secrets in today's health-care system. Music's uses are common and its effects are subtle, so much so that ascribing the positive results of music as a therapeutic regimen is often a concern for those in the field. However, studies involving clinical observations have shown that today's music therapy profession is successful in reaching patients (Hillecke, Nickel, and Bolay, 271, 280). Though music therapists can

often explain when success is reached, there are many unanswered questions as to how and why music therapy works.

> ...one of the major efforts in current music therapy research is to study effectiveness and efficacy of defined interventions...However, even if the corpus of outcome studies in music therapy were extensive and positive enough, the question would still remain about what it is in music therapy that works (Hillecke, Nickel, and Bolay, 272).

Part of the problem is that music therapy techniques are varied, and require customizing for each individual patient, in relation to the unique circumstances of their illness or injury. There is a need to develop better research methods and more adequate practice techniques that repeatedly produce desired outcomes. To quote Hillecke, Nickele, and Bolay: "There is an urgent need for the application of empirical research methods to studying the ingredients of music therapy" (272).

Can we come to a better understanding of how music therapy works, and how to use it more effectively, through studying its success in the neurological rehabilitation of patients with brain disorders? Perhaps therapists must conduct more thorough case studies illustrating comparative descriptions of the healthy brain versus the injured brain, as this might help to uncover what it is about music that lends itself to therapy. Hillecke et al believe, "Neurophysiological investigation methods represent especially important new tools that are relevant in music therapy research and should be integrated into the pluralistic corpus of significant music therapy research methods" (277).

Future neurological studies using music as therapy may help to uncover and illustrate the connection between our emotional well-being and our physical health. Further neurological advancements, particularly in brain injury research, may hold the key to understanding how and why music affects us so deeply. However, it has been

extremely challenging for scientists to quantify the therapeutic effects of music when it is used to foster recovery and rehabilitation. This may be due, in part, to the multifaceted and interdisciplinary nature of the music therapy profession.

> ...the education and training of a music therapist is multidisciplinary, encompassing other subject areas in addition to music...physiology, biology, psychology, counseling, anthropology, and movement/dance. ...music therapy is a diverse field that is influenced by many factors. The training received by music therapists...requires not only a thorough knowledge of music, but also in-depth education in the biological sciences, sociology, anthropology, psychology, and oral and written communication (Davis, Gfeller, Thaut, 11).

Perhaps we need to better understand how the various disciplines relate to one another, so that we may use this process to its greatest advantage to more effectively facilitate healing in the clinical setting.

Chapter I: The Current Music Therapy Profession

There are several misconceptions about the practice of music therapy. One is that the client has to have some particular musical ability to benefit from music therapy. Patients do not need to have any innate musical talent, nor do they need any prior training in the musical arts. Another misconception is that there is one particular style of music that is more therapeutic than all the rest; this is not the case. However, some musical styles do lend themselves better to certain rehabilitative tasks, e.g. physical therapy. Furthermore, despite popular belief, a client does not need to have an intimate association to the music that is used in therapy; although a personal connection can at times be useful in eliciting a response (Davis, Gfeller, and Thaut, 8).

Benefits of Music Therapy

People of all ages can benefit from music therapy (Davis, Gfeller, and Thaut, 8). A music therapist can work with infants, children, adolescents, adults, and the elderly, and their patients can suffer from a wide range of afflictions. The clientèle of a music therapist can include persons with developmental and learning disabilities, physical disabilities, women in labor and those with acute and chronic pain, as well as people with substance abuse problems (8). Most notably, those who suffer from brain injuries and illnesses, such as Alzheimer's Disease and Parkinson's Disease, can greatly reap the benefits of music therapy in the clinical setting.

> Research at Beth Abraham Hospital shows that Parkinson's Disease patients regain some ability to organize and perform movements that were lost due to the disease. Not just any melody will do. The music must evoke a response in each patient, which is used by Tomaino to help the patient enact a specific physiological movement, such as walking. For the patient to move physically, the rhythm must be stimulating and the music familiar enough to allow for carry-over outside the music therapy session (http://www.caregiver.on.ca/cgcihidmmt.html#top, 2008).

A music therapist can be employed at a variety of places including psychiatric hospitals, rehabilitative facilities, medical hospitals, outpatient clinics, daycare treatment centers, agencies serving developmentally disabled persons, community mental health centers, drug and alcohol programs, senior centers, nursing homes, hospice programs, correctional facilities, halfway houses, schools, and even in private practices. Music therapist Elizabeth Huss writes:

> There are many…institutions that hire music therapists. When I was getting started, I looked at a few nursing homes, I looked at a hospice, I looked at schools, and some psychiatric hospitals and children's hospitals. The hospital positions are a little bit rare, because many of them don't have the budget for a full-time music therapist, but they do exist. And some hospital administrators actually use music therapists to cut costs. For example, they will offer music therapy for pain management and therefore reduce some of the medication costs (http://www.performingartsschools .com/guidance/music-therapy/, 2003).

Music therapy is practiced in hospitals to treat patients suffering from various health-related afflictions. Music is generally offered as part of a stress management program to help elevate mood and counteract depression. It is often used as an accompaniment to physical exercise, and assists patients by promoting body movement for physical rehabilitation. Listening to music can also alleviate pain in conjunction with anesthesia or other pain medication (Davis, Gfeller, and Thaut, 9).

Music is often employed to calm or slow down pulse rate, to sedate or induce sleep, to counteract apprehension or fear, and to lesson muscle tension, including the relaxation of the autonomic nervous system. It is also used as a calming influence during therapeutic massage, in intensive care units, as well as in delivery rooms and newborn nurseries. Studies have shown the remarkable effectiveness of music therapy for stress-reduction, and as a calming intervention, in hospital patients about to undergo surgery (Davis, Gfeller, and Thaut, 9).

Music therapy is often used in nursing homes and in assisted-living quarters to aid the elderly who suffer from age-related diseases. Music contributes to these people's daily lives by helping them to increase or maintain their level of physical, mental, and social/emotional functioning. "By providing sensory stimulation, music therapy enhances quality of life and helps prevent or slow mental and physical deterioration" (Davis, Gfeller, and Thaut, 136). As Michael Greene, the former President and CEO of the National Association of Recording Arts and Sciences (NARAS), stated at the 1997 Grammy Awards, "When we look at the body of evidence that the arts contribute to our society, it's absolutely astounding. Music therapists are breaking down the walls of silence and affliction of autism, Alzheimer's, and Parkinson's disease" (http://www.musictherapy.org, 2004).

A music therapist can work with disabled or handicapped students at public or private K-12 schools. When hired in this setting, the music therapist is expected to provide the therapy services listed on the Individualized Education Plan for the mainstreamed special-learner. Learning through music is used to strengthen non-musical areas such as communication and physical coordination, which are vital skills needed for

all students to function properly in their everyday lives (Davis, Gfeller, and Thaut, 260-61).

Music therapy is used to treat those in psychiatric facilities for several reasons. It allows persons with mental health needs to combat depression, explore personal feelings, make positive changes in mood and emotional states, have a sense of control over life through successful experiences, practice problem solving, and resolve conflicts leading to stronger family and peer relationships (Davis, Gfeller, and Thaut, 90). Sen. Harry Reid (D-Nev.) stated in a 1991 telegram,

> "Music helps all types of people to remain forever young." He noted that Congress had never before "directly addressed the question of music" as preventive medicine and as "a therapeutic tool for those suffering from Alzheimer's disease and related dementias, strokes and depression" (http://www.musictherapy.org, 2004).

Music therapy techniques can also be beneficial for healthy individuals. These people can use music for stress reduction via active music making, such as drumming, as well as passive listening for relaxation. Music is often used to support physical exercise routines, it can assist women in labor with their deliveries, and it is even effective when used in conjunction with other suicide prevention methods. Researchers at the Music Therapy Association of British Columbia write,

> Excess stress can cause major damage. Stress could be the biggest factor that leads people to commit suicide. Experts have estimated that up to 75 percent of all medical disorders can be directly related to stress. Stress and anxiety are defined as a stimulus that can end up exhausting the body's defense mechanisms. Music Therapy creates a controlled environment where stress can be isolated out of the patient's life for a while and can furthermore help relax and shift moods or attitude and produce changes in muscle tones, heart rates and blood pressure and gastric motility (http://www.mtabc.com, 2005).

The Goals of Today's Music Therapy Profession

Today's professional music therapist can assess emotional well-being, physical health, social functioning, communication abilities, and cognitive skills all through responses to musical stimuli (http://www.musictherapy.org, 2004). Davis, Gfeller, and Thaut have defined music therapy as,

> ...the use of music in the accomplishment of therapeutic aims: the restoration, maintenance, and improvement of mental and physical health. It is the systematic application of music, as directed by the music therapist in a therapeutic environment, to bring about desirable changes in behavior (7).

They design music sessions for individuals and groups, based on their client's personal needs. Clinical Psychologist Elizabeth Scott states,

> Listening to favorite music can be a great way to unwind, but the soothing and therapeutic properties of music can do more than just help you relax at the end of a busy day. Music therapy is a branch of healthcare dedicated to the use of music for emotional, physical, functional, and educational improvement in a broad range of settings (http://stress.about.com, 2005).

Music therapists use music and imagery and music improvisation to foster better self-expression with patients who have emotional disorders. They use receptive music listening to aid gait training and physical rehabilitation with those who suffer from neurological damage or neuromuscular conditions. A music therapist uses lyric discussion and learning through music to illustrate and reinforce language concepts with healthy children or with brain-injured adults. They use song writing and music performance to help the elderly maintain mental alertness, social involvement, and physical dexterity (Davis, Gfeller, and Thaut, 4-5). The music therapist also participates in interdisciplinary treatment planning, ongoing evaluations, and follow-up appointments (http://www.musictherapy.org, 2004).

Chapter II: The Impact of Music on Society

No one, with the ability to hear, can escape listening to music. It surrounds us at every turn, even if at times unnoticed. Music is ingrained into our daily experiences, so much so that we often take it for granted. Consider music's impact on our daily lives. Music often accompanies us on our drive to work, and sometimes follows us into the workplace. We hear music at the gym, at parties, at ceremonies, at athletic events, on televisions shows, in feature films, on video games, even at our local supermarkets and our favorite department stores. What would our lives be like without music?

Consider music's functions within society. Energetic music can greatly add to any physical activity. It can move a person to dance at a party, can facilitate exercise at the gym, or can excite both the athletes and the audience at a sporting event. Merriam explains how music can elicit crowd behavior, noting that it "encourages physical reactions of the warrior and the hunter" and it "calls forth the physical response of dance" (224). Music is often performed in conjunction with formal ceremonies, throughout the world. It can be heard at various occasions, whether a sacred or secular holiday or any rite of passage. When traditional or religious music is played for a formal or informal function, it can greatly heighten or intensify the emotions of the attendees.

Music also has a very personal effect on people. A person who hears a favorite song on the way to work might be put in a good mood for the rest of the day. One may associate a particular person or event with a certain piece or style of music. Upon

hearing that music again, it will conjure up those memories in the listener's mind, including all the emotions there attached. Neurologist Oliver Sacks, speaks of the emotional “powers of music”, and recalls the philosopher Nietzsche's affinity for listening to works composed by Bizet,

> ...it was not just the rhythmic force of Bizet that appealed to him, but something more particular and personal, so that he was not just driven, propelled by it, but responded creatively to it. It is this which Forster speaks of when he says that the arts do not act in a mechanical way, but rather that "something as mysterious and capricious as the creative impulse has to be released before they can act." This complex, mysterious and capricious "something" Nietzsche called "mnemonic"--he felt this was not mediated by some relatively simple part of the brain but called to the whole individual, the "I", to the particularity of the individual's memories, associations, emotions (4).

Music also lends emotion to other performing arts disciplines, such as dance, theatre and film, by setting the mood for a scene or intensifying the emotions of the actors. In the commercial entertainment world, it would be nearly impossible to find a television show or a mainstream movie that does not include a music soundtrack to add emotional impact to the plot. Many would agree that music has the ability to touch our heart and soul, but is there something deeper to the way music affects us? Can we harness the power of music, in a systematic way, to help and to heal the ill and the injured?

Definitions and Descriptions of Music

If we define music culturally we can understand the role it has had in societies throughout the world in Eastern and Western cultures, and throughout time dating back to the earliest manifestations of human life until the present. Alan Merriam in *The Anthropology of Music* (1964) provides a definition from an anonymous source that

describes what music is and what it does for our cultures: “Music is a complex of activities, ideas and objects that are patterned into culturally meaningful sounds recognized to exist on a level different from secular communication” (Merriam, 27). Taken from *The Role of Music in African Society (1969),* Amoaku quotes Sowande's definition of music as,

> The organization of the raw material of sound into formal and structural patterns that are meaningful and generally acceptable to that society in which the organization has taken place; patterns that relate directly and in a most intimate manner to the world view and the life experiences of that society viewed as a homogeneous whole, and are accepted as such by that society (33).

Though, some choose to define music in purely cultural terms. Music sociologist Christopher Small explains music as a verb: “to music” or “musicking” (12). His broader definition encompasses the idea of playing any part in the performance of music (Small, 12).

> To music is to take part, in any capacity, in a musical performance. That means not only to perform but also to listen, to provide material for performance (what we call composing), to prepare for a performance (what we call practicing or rehearsing), or to take part in any activity that can affect the nature of that style of human encounter which is a musical performance...To music is to pay attention in any way to a musical performance, at whatever level or quality of attention...(Small, 12).

It is impossible to date when human cultures first developed the ability to create music. The origins of music-making are questionable and somewhat speculative.

> Anthropologists have long eschewed the search for ultimate origins of aspects of culture for the simple reason that they appear to be unrecoverable...While the ultimate origin of music may provide material for interesting and even logical speculation, the theories can only remain theories (Merriam, 285).

Our archaeological studies imply that the concept of music-making originated approximately 50,000 years ago, though some believe it might have existed 100,000 years ago, 150,000 years ago, or maybe even 250,000 years ago (Huron, 49).

> In 1995, paleontologist Ivan Turk discovered a bone flute while excavating an ancient burial mound in Divje Babe, Slovenia. This flute has been determined to be between 43,000 and 82,000 years old, using electron spin dating...finding this flute does not mean we have found the earliest musical instrument; this is just the earliest found instrument...prior to the arrival of Europeans, by far the most common instruments in native American cultures were rattles and drums...The same pattern...is evident in African and Polynesian cultures. If we assume that rattles and drums typically predated the use of flutes, then the ancient music makers of Slovenia might well have been creating instrumental music somewhat earlier than 100,000 years ago...If we suppose that singing predated instrument making by 50% of the intervening time, then music making might have existed 150,000 years ago...Even this figure might be a conservative estimate, and the actual origin of music might be twice as old, say around 250,000 years ago...On the other hand, the Divje Babe flute might truly be an early specimen, and singing might have developed about the same time. Using the most recent estimate for the Divje Babe flute would therefore place the origins of music making about 50,000 years ago (Huron, 48-49).

Furthermore, there is biochemical, neurological, behavioral, and anthropological evidence to suggest the possibility that music, or aspects thereof, may be an evolutionary adaptation, much like language (Thaut, 114).

Whatever the definition and whenever the origin, musical sounds are a product of and therefore shaped by the culture that creates them (Merriam, 27). "Music is clearly indispensable to the proper promulgation of the activities that constitute a society; it is a universal human behavior" (Merriam, 227). One must examine the culture to uncover the reasons behind the composition and performance of music. The roles of music within a society are not always easily ascertainable; yet once determined, these roles can usually be discovered in other cultures. The functions of music could be for aesthetic enjoyment,

for communication, they could be symbolically representative, or could evoke physical responses. Music's functions may also enforce conformity to social norms, and can contribute to the continuity and stability of culture (Merriam, 223-224).

Music and Human Behavior

The kinds of behavior associated with music are organized into four major categories: learning behavior, social behavior, verbal behavior, and physical behavior (Merriam, 103). Learning behavior refers to how musicians learn to produce appropriate musical sounds. Social behavior encompasses the interaction between those who produce the music, those who listen to the music, and those who both listen to and respond to the music. Verbal behavior entails "what people say about music structure and the criteria which surround it" (114). The production of music has had different functions in societies through the ages. However, the physical behavior associated with the production of music has remained largely the same (122).

Physical Behavior

Physical behavior includes the necessity to manipulate the body in order to produce musical sounds, e.g. the limbs, fingers, lips, tongue, diaphragm and/or vocal chords (Merriam, 103). There exists three divisions or subsets of the physical behavior associated with music: the production of sound, the bodily attitude when producing sounds, i.e. posture, emotional tension, singing style and vocal tension, and lastly the response of the organism(s) to the musical sounds (110-111).

Einstein's famous theory $E=MC^2$ posits that everything can be converted from matter to energy and vice versa. In order to convert matter to energy, the rate of vibration must be increased. All the sounds we hear are a result of vibration, so simply stated, this

theory postulates that sound has the ability to affect matter, whether that matter is technically alive or not (Campbell, 1991). This thesis will mostly focus on mankind's emotional and physical response to sound or music, and will examine the known therapeutic effects of musical sounds.

Chapter III: The Origins and History of Healing with Music

Although music therapy as an organized health-care profession began about 60 years ago, the concept of using music as a healing tool which could affect behavior and health may have begun 10,000 to 50,000 years ago during the Paleolithic period, with shamanic traditions that combined music and healing (Winkelman, 320).

> The notion of music as therapy is based on ancient cross-cultural beliefs that music has a therapeutic effect on the mind and body. Historical interpretations of the mechanisms of music in therapy have almost always emphasized cultural- and social science-based causalities within educational, emotional-motivational (cathartic), or spiritual and religious models of explanation and application (Thaut, 114).

The shamanic traditions are methods of healing that were practiced in most ancient cultures of the world – in Africa, as well as China, Japan, Korea, Viet Nam, Taiwan, and other Asian countries (Hawkins, 1994).

> ...the term "shaman" is sometimes used in the broad sense of medicine man, magician, soothsayer....although the shaman is a medicine man (because he does make efforts to cure the sick), not all medicine men are shamans in the sense that they practice ecstasy. Similarly, the shaman is not necessarily a magician or soothsayer, although cases are known in which he is or becomes one. ..."specialists of the sacred" (medicine men, magicians; contemplative, inspired, and possessed people, etc.)...know how to employ ecstasy for the benefit of the community. Ecstasy always involves a trance, whether "symbolic" or pretended or real, and the trance is interpreted as a temporary abandonment of the body by the soul of the shaman. During ecstasy, the soul of the shaman is thought to ascend to Heaven, to descend to the other world (to the netherworld) or to travel far away into space. ...the "ecstasy" (trance, "losing one's soul," losing consciousness) seems to form an integral part of the human condition (Eliade, 153-154).

The shamans in China were chosen one of two ways: one for exhibiting intelligence and diligence, or two for exhibiting self-healing from sickness or injury, otherwise known as the wounded healer (Hawkins, 1994). The latter of the two possesses the firsthand experience of recovery from sickness or injury, and has the ability to use her or his knowledge in an empathetic capacity. The concept of the wounded healer is an ancient archetype, common to the shamanic traditions in most cultures. In some South American indigenous tribes, one who survives a lightening strike is made a shaman (Davis, 1996).

Though the earliest found musical instrument to date is a flute, some speculate that a drum was the first instrument created by humans (Huron, 49). Throughout the world, the materials used to make drums and the methods of their construction have been relatively similar, although the style of playing and the cultural diffusion have varied slightly (Ronald R. Smith, 175).

> Our investigation of culture-anatomy may begin with African drum forms. By far the larger part of African drums consist of a log scooped out, one or both ends covered with hide...Besides these commonest drum forms, others occur made entirely of a log, hewn round or with angles; in the latter case usually wedge-shaped, the broad surface resting on the ground (Merriam, 286).

Drums are percussive instruments that are considered part of the membranophone family (Wade, 34-35). The body of a drum, more often than not, was made of different types of wood, usually soft in density (Ronald R. Smith, 177). The head of a drum consisted of a membrane stretched over the top of the body, usually made of animal skin: deer, goat, pig, or cat (177). Ronald R. Smith explains that the,

> ...sound produced by any drum is more dependent on the diameter of the head and the type of skin as well as the amount of tension on the

> head...(and)...The actual pitch of the drum will depend more upon the diameter of the head, internal bore, and the tension of the skin than on the actual length of the drum body (175, 177).

In Africa, the birthplace of the human race, many drummers were healers. These medicine men and their drums accompanied most large ceremonies and rituals of transition such as birth, puberty, marriage, and death (Nicholls, 93). This can also be said for the shamans of today. On observing the Apache Indians, Merriam quotes McAllester as noting that,

> [Healing] is performed at a large gathering, the larger the better, by the medicine man, and all who know the chant even partly join in. There are drummers, dancers and many on-lookers. The whole community, men, women, children and dogs are present, all participating, if only being there (Merriam, 73).

Shamanic cultures all over the world make use of percussive instruments. It is theorized that the repetitive and monotonous rhythms produced by drumming are meant to alter the consciousness and induce a trance-like state. It is also thought that this style of drumming is used to simulate or reproduce the sound of the heartbeat heard by all infants in their mother's womb (Hawkins, 1994).

Alfred Tomatis, a French Otorhinolaryngologist and expert on hearing and sound, explains: "The ear is the first perceptual organ to mature--in the fifth month of pregnancy" (Campbell, 1991). Our first perceptions are shaped by aural stimuli, making sound the universal language that it is. Even those born deaf can still feel the vibrations, from the sound of the heartbeat, inside the womb. Heidi Hawkins, Acupuncturist, states:

> Rhythm is the primordial and fundamental element of music. The poet d'Annunzio calls rhythm the heart of music. Rhythm has an intense, immediate effect on people, directly affecting the body and emotions. It is very hard not to move your body when you hear a powerful rhythm. Nature has rhythms, such as the rhythm of the seasons, the rhythm of the

> Moon orbiting the Earth, waxing and waning, the cycles of life. In audible vibrations, a slow vibration is a rhythm, and a fast vibration is a tone. Drum rhythms can connect us to nature…connect us to the universal rhythm of the heartbeat. It binds us all together as the human race. Connection is a healing experience (1994).

Using Music as Therapy

There is much evidence to support that various forms of music therapy existed in preliterate cultures, as we know that shamanic healing rituals were accompanied by songs. However, since the rise of civilization and thus written communication even more evidence has been found in the first civilizations in what is now known as Iraq c. 6,000 B.C., in ancient Egypt c. 5,000 B.C., and in the Babylonian culture c. 1,850 B.C. (Davis, Gfeller, Thaut, 17).

> Egyptian music healers enjoyed a privileged existence because of their close relationships with priests and other important government leaders. Egyptian priest-physicians referred to music as medicine for the soul and often included chant therapies as part of medical practice (17).

Several examples of the therapeutic effects of music are described in the Bible. One in particular is of David playing his harp to the mad Saul, restoring him to his self and to reality. One such quote from the Bible explains, "And it came to pass when the evil spirit from God was upon Saul that David took up a harp and played with his hand; so that Saul was refreshed and was well and the evil spirit departed from him" (I Samuel 16:23). We know that the ancient Jewish people held the concept of the magical healing power of music at least up until the late Talmudic times. One Talmudic story tells of how a song was thought to afford the people protection against the epidemics of the day (Sendry and Norton, 203).

Writings on music and healing were also discovered in ancient Greece c. 600 B.C., in the time of Plato and his disciples,

> In 600 B.C. Thales is purported to have cured a plague in Sparta by means of music, and Pythagoras directed that music be used to cure mental disorders. Thus from the earliest history of our own culture there is ample record that music has been held to have a direct influence on the individual biological organism (Merriam, 111).

The Greeks often made mention of the magical healing powers of music in their myths: the Sirens, Orpheus, Arion and his dolphins; "by playing his lyre Amphion raised the walls of Thebes. The Greeks knew of the powers of music to entrance...Aeschylus calls (song) 'a binding spell'. Music was thought to have the power to heal" (Wallace, 262). In ancient Greece, the power of music was a well-recognized and widespread perception,

> ...music's ability to change or disturb the social order was also widely recognized, in anecdote, poetry, and philosophical discussion. We are told, for example, that in listening to the songs of Terpander the Spartans grew unified in concord: 'they were entirely changed, embracing and tearfully kissing one another'...(Wallace, 263).

The music of ancient Greece consisted of several *harmoniai*, otherwise known as modes. These modes were comprised of distinctive sequences of note intervals, much like our modern day scales. Wallace states that each mode may have emphasized particular pitches, different rhythms, and varying styles, when in performance (260). "Each of these *harmoniai* was associated with a particular people: Dorians, Phrygians, Lydians, and so forth" (Wallace, 260). In reference to what Damon thought about *harmoniai*,

> ...he correlated them with different psychological states or modes of behavior. As for the kinds of psychological states or types of behavior that Damon thought *harmoniai* could produce, Plato limits us to examples from rhythms: physical violence, disgraceful behavior, madness, and their opposites (Wallace, 260).

These musical modes were thought to possess different emotional characters or ethos, which could at times be "powerfully moving" (Winnington-Ingram, 47).

Through to the Middle Ages, c. 476-1450 A.D., the Greek beliefs in the curative powers of music were still largely accepted and used in medicine; however, when the Renaissance era came, music's therapeutic effects were then questioned. Doctors and scientists of this period made great advances in anatomy, physiology, and clinical medicine, which gave birth to the scientific approach. The use of music as therapy increasingly lost its value in the eyes of most physicians of the day. They believed, as do many doctors in this day, that the therapeutic effects of music are solely based on anecdotal, rather than scientific, evidence (Davis, Gfeller, Thaut, 17-18).

Before the twentieth century profession of music therapy came into existence in the United States, music was used in this country in the late eighteenth century to care for mentally and physically ill patients (Davis, Gfeller, Thaut, 19-20). We know this from the discovery of two anonymous articles published during that time that made references to the idea of using music in a therapeutic capacity to heal sick persons.

The first entitled "Music Physically Considered" was found in The Columbian Magazine in 1789. The author explains,

> ...(when) the mind enjoys composure or serenity...the body may then be said to be only subject to its own functions – (these) passions may be employed with propriety to obviate any excess or irregularity...and ...the proper application of them has the power, equal to any thing we know of, to restore the balance to the animal system when disordered...The propriety of the passions of the mind, when called into the aid of the physician...I would beg leave to recommend music...(90).

An example is provided to illustrate "the happy change produced in the body, by the power of music" (90).

After suffering excessive fatigue, a dance-master fell pray to a debilitating, nervous fever which rendered him extremely lethargic. He labored with this condition for a considerable amount of time, until he finally lost his ability to speak and was seized by violent delirious episodes. However, upon a visitor playing the violin for him, he immediately appeared to be pleased, joyful, and complacent; and after listening to the music for about twenty minutes, he regained his speech, thanked the musician, fell into a deep sleep, and then awoke completely recovered (90).

The second entitled "Remarkable Cure of a Fever by Music" was found in New York Weekly Magazine in 1796. This person was a "celebrated master of music, a doctor in the science, and a great composer" (629), who suffered from some of the same health conditions as the first patient: an unrelenting fever, that increased on a daily basis and became perpetual in nature, violent delirium which resulted in load shrieks, tearful outbursts, and panic attacks, as well as "perpetual wakefulness" with little intermission (629). After requesting a small concert of his own works, "...his countenance assumed a serene and pleasing air, his eyes were no longer fierce or wild, the convulsions totally ceased, he shed tears of pleasure, and shewed a much greater sensibility than could be expected or hoped for so soon" (629).

There were more documented newspaper articles, journal articles, essays, and treatises on using music as therapy published in the United States in the nineteenth century (Davis, Gfeller, Thaut, 20-22). However, it wasn't until the twentieth century that the physicians in the professional medical fields of this country first took notice of music's therapeutic effects (23-24). In the 1940s, doctors and therapists realized that when patients listened to music it fostered a

soothing effect, or more specifically the lowering of blood pressure, which in turn lead to reduced anxiety and alleviated pain for the patients (24-27).

United States doctors in the Veterans Affairs hospitals of World War I and II recognized the therapeutic effects of music. They noticed a significant amount of improvement in the patients exposed to entertainment by professional musicians, more so than those who were not exposed to music. This improvement in the patients' mental, emotional, and thus physical conditions was the catalyst that prompted the need for music therapy curriculum at American colleges, which allowed the discipline to gain its rightful acceptance in our professional medical fields (Davis, Gfeller, Thaut, 23-24). This next chapter will provide examples of how modern-day musicians are entertaining patients in clinical settings, and will suggest that the human interaction fostered by a chamber music performance can facilitate a healing environment.

Chapter IV: Approaching Healing through Music

I have been the coordinator of the grant-supported "Healing by Music Project" at Florida Atlantic University for the past two years. My primary function has been to place music students in clinical settings such as hospice, Alzheimer's facilities, rehabilitation centers, general hospitals, and children's oncology wards, in order to perform chamber music for patients. I have worked closely with the Chair of our Department of Music to meet the specifications of the grant, and have acted not only as the supervisor of this program but also as a performer on many occasions.

The goal of this project is to facilitate healing through live music performance. This is not considered music therapy, as we are not board-certified nor are we trained in those specific rehabilitative techniques. If these concerts were part of a music therapy program, then patients would be required to actively participate in the music-making, to meet the needs of those goal-oriented therapeutic practices. When we play music for patients, they are not required to participate in our performance, though some occasionally sing along with a recognized tune, e.g. religious or patriotic. However, our audience members do seem to be fully engaged and engrossed in our concerts as attentive listeners and appreciative audiences.

From this project, I discovered more deeply what music is to our culture and how music functions in our society. It has become apparent that when people share their music-making with others, it is almost always an extra-musical experience for those

listening. This program has shown me firsthand how shared musical experiences can greatly improve patients' demeanor by providing a joyful atmosphere, which can in turn better facilitate the healing process.

Past performance experience in clinical settings has revealed how important it is for chamber musicians of this kind to be aware that a change in venue and/or audience should affect a player's state of mind for a concert. Musicians must recognize the setting for their performances, e.g. whether they are to play a more formal recital or concert, or if the event calls for them to act as background music for a social gathering, where everyone is eating, drinking, and talking. It is necessary to adapt to the venue/audience environment by adjusting the style of performance, as to meet the needs of the patient demographic. When chamber musicians play for people in a hospital setting, they should change their type of music, style of playing, or even manner of dress, depending on where they are performing and for whom they are performing.

Another concept that this type of chamber musician should recognize is that some performance settings require a verbal, interactive aspect in between musical selections. Chamber musicians playing in health-care facilities need to gear their manner of speaking toward the audience members or patrons, whether the musical group is playing for youngsters at a children's hospital, for adults at a rehabilitation center, or for the elderly at an Alzheimer's Facility. When playing music in a clinical setting, most of the patients need to have a verbal aspect to the concert in order to keep their attention and interest.

Performances at four different venues serve as examples of how music can promote a healthy atmosphere and/or a healing environment. The first was a physical rehabilitation hospital and outpatient center. Here my classical woodwind trio (flute,

oboe, and clarinet) performed at a party for stroke victims and their loved ones. As is common to this demographic, many patients were senior citizens. Our repertoire consisted of chamber music transcriptions by Mozart and Haydn, which were originally written for string instruments.

Though this hospital is located in South Florida, many of the older persons at the center originally lived in New York, New Jersey or elsewhere in the Northeast. Growing up in these areas, and having a great appreciation for the arts, many of these people saw Broadway shows when they were young. When talking with the patients after our concert, they all agreed that listening to our performance brought back fond memories of their youth. It is my belief that they so greatly enjoyed hearing our music because it most likely made them remember where and how they were raised, their old friends and family members, and possibly because it reminded them of younger and better times in their lives.

On another occasion, I scheduled a jazz trio to perform for the same group of patients at the same facility. This trio consisted of two guitars (one lead and one rhythm) and one bass. Acting only as supervisor, and not performer, afforded the opportunity to pay closer attention to the audience's reactions to the music at the party. The standard jazz tunes played by the trio were upbeat in nature, and had a steady danceable rhythm. Though most of the stroke victims had trouble with mobility, and some could no longer walk, I noticed that many of them moved their bodies to the rhythm of the music. Those in wheelchairs were tapping their fingers to the rhythm, and those with walkers were tapping their toes to the beat. It was so encouraging to see how the music moved these people to move, even though their overall mobility was limited.

The next facility was a children's hospital. Here my classical woodwind trio played for child cancer patients in the hospital's oncology ward. These young people were very excited for our performance, as it was something out of the ordinary for them. I could only imagine what a day in their life would be like, but it no doubt consists of various treatments and therapies. Our performance was something out of the norm for them, which broke the monotony of their daily activities.

For this concert, we not only played our usual classical repertoire, but we also included some children's tunes from Walt Disney movies as well. It was so heartening to see and hear them clapping and singing along with the songs. This concert was beneficial, not only for the musical aspect, but for the children's shared experience with their fellow patients. After our performance, we opened the floor for questions and answers, and we were able to teach them about how our different instruments produced musical sounds. We made a tremendous impact on these young patients, if only for the idea that people outside of their world took the time to bring them the fun that is music. This was also a great day for our musicians, as it was very rewarding to entertain and educate these children who are less fortunate than most.

The third venue was a daycare center for the rehabilitation of Alzheimer's patients. At this facility we performed two different types of concerts. Sometimes we played formal recitals, and patients were expected to act as attentive listeners, and adhere to the usual customary manners of an audience. At other times we played background music for festive events or parties, where patients were both allowed and encouraged to mill about and interact with their fellow peers.

Much like the youngsters at the children's hospital, our performances were something out of the ordinary for these patients and it broke the monotony of their day-to-day activities. Also, owing to similarities in backgrounds with those at the rehabilitation hospital, our music reminded many patients of seeing Broadway shows in their youth. When patients recognized a song, whether an old jazz standard, a holiday tune, or a patriot song, it was amazing to hear them hum or sing along with the music they were listening to. It was hard for me to fully grasp how these elderly persons could remember the pitches, rhythm, and words to a song that they probably haven't heard in a great while; but then at the same time they couldn't remember the voice or face of their own child. This speaks to music's powerful affect as a mnemonic device, and it proves to me that we do not yet fully understand the range or magnitude of this art form.

The fourth performance venue was a hospice, where patients are terminally ill and ninety percent of them are bed-ridden. For this location I have only scheduled classical musicians to perform. My contacts and I agreed that jazz music would not be appropriate, as it might unnecessarily alarm the patients. I have had my classical woodwind trio play there, as well as a classical violin and piano duet. Our goal was to provide a soothing atmosphere, and to that end we decided only to play pieces with slower tempos.

The performances at these facilities were appreciated by more than just the patients. When the staff there, whether doctors, nurses, therapists, or custodians, heard our group they would stop in their tracks to listen to us. They explained that experiencing our music provided a much-needed relaxing moment amidst the stress, sadness, and depression they so often encountered in their stressful jobs. I was also

informed that these performances were equally as comforting for the patent's families as well.

On one occasion, I spoke to a woman who was visiting her dying father. She said she felt so alone and isolated from the world in that cold little room, and that no one could understand the pain she was experiencing. However, upon hearing the music, she stepped out of that room and into the atrium where we were playing. When seeing the other patients and their family members gathered around us, she said that she just didn't feel so alone anymore. She realized that she was not the only person dealing with this difficult experience, and that there were other people much like her that were feeling the same fear, emotional pain, and great sadness. She told me that our presence at hospice on that day was so incredibly moving. I told her that hearing the profound impact our music made in her life felt equally if not more moving.

Performing these chamber music concerts at local hospitals has shown that patients of any age, injury, or illness can find comfort in the fact that a person, who does not even know them, does understand their medical situation and cares about their physical, mental, and emotional well-being. This type of shared musical experience can facilitate healing and make people realize that they are not alone in life, allowing them to take solace in the fact that other people both know and understand their pain and suffering. The shared experience of music-making can be as empowering as it is enlightening.

Most notably, these very intimate mini-concerts performed at local hospitals are not solely entertainment. Chamber music performances foster a special kind of human

interaction that can be beneficial to all parties involved, audience members and performers alike.

> Music...provides a rallying point around which the members of society gather to engage in activities which require the cooperation and coordination of the group...every society has occasions signaled by music which draw its members together and reminds them of their unity (Merriam, 227).

Music brings people together in a positive manner. The unity so often accomplished through the music-making and listening experience can have profound effects, on both the active performer and the attentive listener. The communal sense of understanding which is often achieved through music performance should be more deeply explored and more frequently implemented. The next chapter explains how these types of chamber music performances for the veterans of World Wars I and II prompted the need for training. Doctors realized that musicians needed to have some education in the medical sciences before performing for patients in clinical settings. This led to the rise of the professional music therapy field as we know it today.

Chapter V: The Advent of Music Therapy as a Profession

The twentieth century discipline of music therapy began after the first two world wars, when community musicians of all types played at the Veterans Affairs hospitals around the nation. These musicians, both amateur and professional, performed for the thousands of veterans suffering mental, emotional, and physical trauma from the wars. The patients' notable responses to music led the doctors and nurses to request the hiring of musicians by the hospitals. It was soon evident that these hospital musicians needed some prior training before entering the facilities. This need for training launched the development of a college curriculum. The first music therapy degree program in the world, founded at Michigan State University in 1944, celebrated its 64th anniversary in September of 2008 (Davis, Gfeller, Thaut, 27-28).

Although the first music therapy degree program was not founded until 1944, the first University-level coursework was offered in 1919. An English pianist named Margaret Anderton taught the first ever music therapy courses at New York City's Columbia University. She had used music as therapy to treat physically and mentally disabled Canadian soldiers during World War I. Her course objectives were "to cover the psycho-physiological action of music and to provide practical training for therapeutic treatment under medical control" (Davis, Gfeller, Thaut, 24).

The National Association for Music Therapy was founded in 1950, and then The American Association for Music Therapy was founded in 1971. These two national

music therapy organizations united in 1998 to form The American Music Therapy Association. The AMTA is the largest professional music therapy association, which represents over 5,000 therapists, corporate members, and other related organizations worldwide. This organization sets the educational and clinical training standards for all board certified music therapists. The objective of the AMTA is to progress the development of music therapy as used to rehabilitate the ill or injured patient, to educate the special-education student, and/or to raise awareness in the community. It is this organization's mission to perpetuate "the advancement of education, training, professional standards, credentials, and research in support of the music therapy profession" (http://www.musictherapy.org, 2004).

As in all academic fields, educational coursework is a crucial part of learning any discipline, as it provides students with essential, theoretical background information. This can include the former knowledge that old theories were based on, as well as the direction of the current research that is forming the newest theories in the field. Internships are an equally important part of a student's education. The practicum aspect of training is imperative, as it provides students with much-needed observation time in the clinical setting. It also allows students the opportunity to apply what they have already learned in theory. This application process is an essential part of training, as most would agree that there are some things that can only be learned with theory followed by practice, and not theory alone.

In order to be qualified to practice music therapy, a person must complete one of the 69 approved college music therapy programs, including internship, and then they are eligible to sit for the national examination offered by the Certification Board for Music

Therapists (CBMT). The CBMT is a separate and independent organization that certifies music therapists. Board certified music therapists administer a national music therapy certification examination, which is officially recognized by the National Commission on Certifying Agencies. This examination measures the individual's conceptual knowledge, and their ability to apply that knowledge to the professional music therapy practice. Those who pass the national music therapy certification examination earn the credential Music Therapist - Board Certified or MT-BC. These individuals have met accepted educational and clinical training standards, and are qualified to practice music therapy in the field (Davis, Gfeller, Thaut, 11-12). The academic standards for a Bachelor's Degree in Music Therapy include the following courses:

Musical Foundations (45%)

- Music Theory
- Composition and Arranging
- Music History and Literature
- Applied Music Major
- Ensembles
- Conducting
- Functional Piano, Guitar, and Voice

Clinical Foundations (15%)

- Exceptionality and Psychopathology
- Normal Human Development
- Principles of Therapy
- The Therapeutic Relationship

Music Therapy (15%)

- Foundations and Principles
- Assessment and Evaluation
- Methods and Techniques
- Pre-Internship and Internship Courses
- Psychology of Music
- Music Therapy Research

- Influence of Music on Behavior
- Music Therapy with Various Populations

General Education (20-25%)

- English, Math, Social Sciences, Arts,
- Humanities, Physical Sciences, etc.

Electives (5%)

For a complete listing of the AMTA Standards for Education and Training, please see their on-line handbook at: http://www.musictherapy.org/handbook/edctstan.html#TOP.

The AMTA has a system that determines the effectiveness of clinical programs, and music therapists participate in the process by reviewing programs within their facilities. The mechanisms for evaluating the quality of a program include the Standards of Practice, a Code of Ethics, a system for Peer Review, a Judicial Review Board, and an Ethics Board. The AMTA has many affiliations and holds organizational membership in various coalitions. These include the Consortium for Citizens with Disabilities, National Alliance of Pupil Services Organizations, National Coalition of Creative Arts Therapies Associations, Commission on Accreditation of Rehabilitation Facilities (CARF), National Association of Critical Care Nurses, and the National Rehabilitation Caucus (http://www.musictherapy.org, 2004).

The AMTA also publishes many academic journals that are excellent resources for practitioners. Official publications include: The Journal of Music Therapy, a quarterly research-oriented journal; Music Therapy Perspectives, a semi-annual, practice-oriented journal; Music Therapy Matters, a quarterly newsletter; and a variety of other monographs, bibliographies, and brochures. The AMTA promotes a vast amount of

research exploring the medical benefits of music, through the publication of these journals and other such resources (http://www.musictherapy.org, 2004).

There is a substantial body of literature in existence today, much of which can be found in these journals that proves that people of all ages and afflictions can reap the medicinal value of music therapy; however, recognition alone will not help to advance the profession. There are many well-documented case studies, which can be located in scientific journals such as Scientific American and The New York Academy of Sciences, that recognize the effectiveness of music therapy; although, there does not exist enough quantifiable data to convince the well-educated skeptic. Perhaps the area of music therapy used for brain-injured patients holds the most promise in uncovering the scientific proof needed to persuade the masses.

> Neurocognitive research has the potential as a basic research approach to identify and explain relevant effects of music in therapy by the use of experimental research designs and neurophysiological investigation methods (Hillecke, Nickel, and Bolay, 274).

Chapter VI: Known Brain Processes, and How the Brain Processes Music

Much about how the human brain works remains a mystery. For centuries, scientists have been attempting to comprehend how this organ controls our intellectual processes, perceives our sensory inputs, facilitates our body's movements, and regulates both our demeanor and behavior. In the last twenty years, science has made remarkable advances in brain research (Thaut, ix). Thanks to exciting new advancements in the neurological and behavioral sciences, and with the help of newly developed technology and techniques, neuroscientists are beginning to uncover some of the mysteries surrounding this complex organ. Though there is still much research to be done, the more recent studies and their outcomes are both promising and encouraging.

Today's medical technology has enabled us to properly discern the value of music from a biological standpoint. Neuroimaging tools such as MRIs, CT scans, and PET scans can all trace music's impact on the human brain. By tracing its impact, we can isolate the brain pathways and mechanisms involved. From this isolation, we can infer that these effects also happen on a physical level. Damage to one particular area of the brain can result in impaired musical abilities, confirming the assumption that these abilities are a "built-in" part of human physicality (Jensen, 17). Furthermore, the existence of child prodigies implies that musical abilities are partially genetic (17).

According to the neurobiological sciences, there are five crucial systems that influence the human learning behavior: cognitive, emotional, perceptual-motor, stress

response, and memory. These systems include the following - 1) Cognitive: visual-spatial, mathematical, and creative, 2) Emotional: endocrine, hormonal, social and personal skills, and cultural and aesthetic appreciation, 3) Perceptual-Motor: vestibular, sensory, acuity, and timing, 4) Stress Response: immune response, autonomic nervous system, and sympathetic and parasympathetic systems, and 5) Memory: attention, concentration, and recall (Jensen, 18).

All of these systems are dependent upon each other, and often interact simultaneously. Therefore it becomes very difficult to weigh and measure the success of one single system (Jensen, 18). Educator Eric Jensen believes,

> While we can identify a system (i.e. emotional), it's crucial to understand that the human being is truly a system of systems. The emotional system impacts the cognitive system, which impacts the motor system, which impacts the immune system, and so on.

Research has proven that cognitive abilities can be greatly enhanced if one is actively involved in the production of music. Simply stated, music stimulates and synchronizes the neural firing patterns that organize and join multiple cognitive brain areas. In turn, this enhances the brain's ability to be more efficient and effective (Jensen, 30).

An adult brain has more than 10,000,000,000 nerve cells or neurons. Almost all neurons are formed by the first year of life, and since these cells cannot divide, they cannot be replaced. To increase the capacity of our long-term memory, these neurons must make connections with other neurons. The stimulation of more neurons produces greater memory. Music has the incredible ability to activate neurons for the purpose of producing long-range memories. We can measure this by injecting the brain with radioactive chemicals that are detected when the cells are active (Campbell, 1992).

In 1947, the Canadian psychologist Donald Hebb discovered that the synapses and neural networks in the brain are at the core of learning. Years later the hypothesis of the "Neural Synchrony" came into existence. This theory stated that the activation between groups of the cortical neurons aid the cortex in pattern recognition. It is said that this multiple-area, cross-stimulation might be necessary for higher brain functions, such as cognition, memory, and music. The coherence theory states that music induces a significant amount of activity, and disperses neural firing over a large area connecting all the areas of the brain (Jensen, 32).

> The recent body of brain research shows impressively that sensory experience changes the brain. An enriched sensory environment facilitates the construction of synaptic connections and the proliferation of highly distributed networks of neuronal ensembles. Exposure, learning, and training shape and develop the complexity of the neuronal architecture, the wiring scheme of the brain, into a more and more diverse and efficient executive system. Music can play an interesting dual role in this process; on one hand, it is a part of the basic biological blueprint of the brain and, on the other hand, it is a strong environmental sensory stimulus able to influence changes in the brain (Thaut, 16).

The human brain consists of three parts: the hindbrain, the midbrain, and the forebrain. The hindbrain is made up of the upper part of the spinal cord, the brain stem, and a ball of tissue called the cerebellum. It was found that the hindbrain regulates our bodies' most vital functioning, such as our heart rate and our respiration. The midbrain is comprised of the upper part of the brainstem. It is understood that this section of the brain commands the body's involuntary movements, otherwise known as reflexes, and it also controls voluntary ones as well, such as eye movement. On the topic of rhythm in music and brain functioning, Thaut explains that there are...

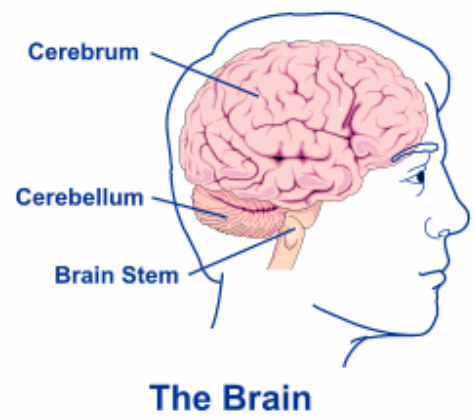
> ...strong activations in bilateral posterior lateral cerebellar hemispheres during...tempo, meter, and pattern discrimination...Pattern discrimination

> showed significant activation in midbrain regions, as well as bilateral posterior lateral hemispheres...The neurobiology of rhythm shows a widely distributed cortical and subcortical network subserving motor, sensory, and cognitive aspects of rhythm processing...However, cerebellar pathology does not affect the capacity of auditory rhythms to entrain rhythmic motor responses, suggesting that sensory rhythms can compensate for brain mechanisms related to timing that are dysfunctional due to disease or injury (52-58).

The biggest in size and most highly evolved part of the brain is the forebrain. This portion of the brain is mainly composed of the cerebrum, and the underlying structures referred to as the inner brain (Figure 1). The cerebellum facilitates our body movements, and this part of the brain is used in rote learning such as playing the piano. Researchers at the National Institute of Neurological Disorders and Stroke explain,

> The cerebrum sits at the topmost part of the brain and is the source of intellectual activities. It holds your memories, allows you to plan, enables you to imagine and think. It allows you to recognize friends, read books, and play games (http://www.ninds.nih.gov, 2007).

Figure 1: The Brain (http://www.brainwave-entrainment.com/)



The cerebrum is divided into two hemispheres, right and left; with each side containing four different sections or lobes: the frontal lobe, the parietal lobe, the occipital lobe, and

the temporal lobe. Neuroscientists believe that each section of the brain has its own unique abilities and functions (http://www.ninds.nih.gov, 2007).

The two frontal lobes of the hemispheres are located just behind the forehead. Scientists agree that this part of the brain is used for reason, judgment, imagination, planning, and memory. It is also known that this section controls our motor functions and our language production. In the rear of the frontal lobes is the motor area, which is close to the midbrain; it is responsible for our body movements. The frontal lobes act as storage units for short-term memory, permitting one thought to be kept in the 'back of our mind', as another thought is being pondered. In the frontal lobe of the left hemisphere is a section called Broca's area. Scientists credit this area for being able to convert our mind's thoughts into spoken words (http://www.iscid.org, 2007). Music therapy has been shown to effect brain plasticity by "accessing and reactivating" speech centers for aphasic Broca's patients (Thaut, 68).

> ...studies and neuroanatomical research related to encoding of spoken language versus singing have shed considerable light on the possible explanations for the facilitation of verbal output though song...a simple shift of the encoding process of speech from the left hemispheric temporal-frontal speech centers to the right hemispheric homologues, thus bypassing damaged neural pathways and speech structures in the brain...These findings raise questions about the neural circuitry for singing, which may be more diffusely located and, as such, harder to disrupt than the highly localized speech centers in the left hemisphere (69).

The two areas directly behind the frontal lobes are referred to as the parietal lobes. This part of the brain is the least understood. It is believed that the front parts of these lobes, which lie just behind the motor areas, are the main sensory areas of the brain. These lobes receive information such as taste, touch, temperature, movement and pain.

These lobes also account for our abilities in both reading and arithmetic (http://www.iscid.org, 2007).

The occipital lobes can be found in the very back of the hemispheres. This part of the brain is known to control our visual system. These lobes process the images that we see with our eyes, and then connect that information with past images in our memory. When someone sustains a head injury to this area of their brain, if the damage is severe enough, they can suffer from blindness (http://www.iscid.org, 2007).

The last of the four sections are the temporal lobes. These lobes are located in front of the occipital lobes, underneath the frontal and parietal lobes. It is thought that the top part of these lobes controls the receiving of information from the sounds we hear. It is also believed that the underside of these lobes plays a part in storing and accessing our memories, including all of the sensations that accompanied them (http://www.iscid.org, 2007). Studies involving music and neuronal synchronization suggest that,

> Musical learning may access compensatory pathways for memory functions...associated with learning and recall. Music learning may also confer a neurophysiological advantage through the stronger synchronization of the neuronal cell assemblies underlying verbal learning and memory...data provide evidence that melodic-rhythmic templates as temporal structures in music may drive internal rhythm formation in recurrent cortical networks involved in learning and memory (Thaut, Peterson, and McIntosh, 2005).

The layer of tissue that coats the surface of the cerebrum and the cerebellum is known as the cerebral cortex. This outer layer is often referred to by the general term 'gray matter'. It is approximately 2 mm in thickness, and is comprised of neurons and other cell bodies, whose job it is to process most of the information we receive, resulting in our thoughts, perceptions, and memories. The inner brain is comprised of four

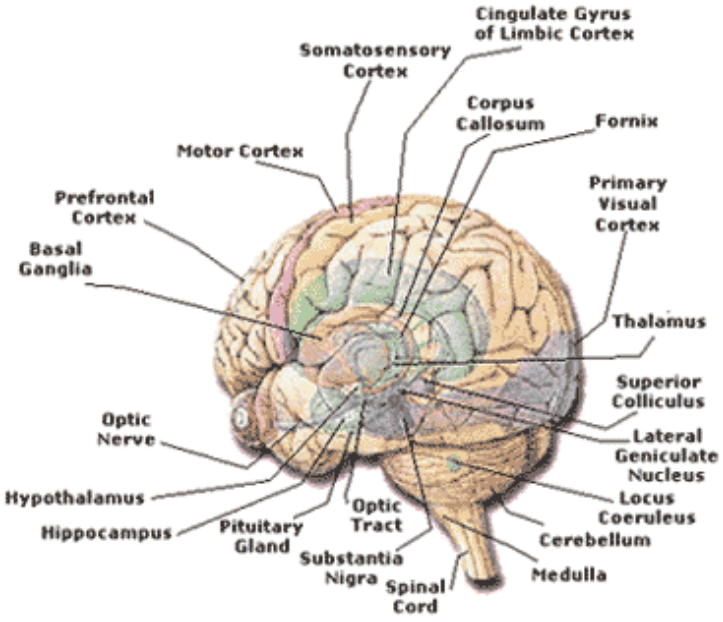
structures: the hypothalamus, the thalamus, the hippocampus, and the basal ganglia; each with corresponding mirror images on the opposite hemisphere. It is agreed that these sections of the brain play a vital role in controlling our perceptions, our emotions, and our subsequent responses. It is also said that these structures play a part in our motor abilities, by allowing us to initiate body movements without conscience thought processes (http://www.ninds.nih.gov, 2007).

The hypothalamus consists of many different parts and holds several essential functions. This section of the brain is responsible for waking us up, releasing adrenaline, directing the pituitary gland, regulating temperature, and controlling emotions. Located near the hypothalamus, the thalamus receives sensory inputs and communicates information to the cerebral cortex. This part of the brain also receives information from the cerebral cortex and sends it to the cerebrum and the spinal cord (http://www.ninds.nih.gov, 2007).

As part of the limbic system, the hippocampus is connected to the hypothalamus and the thalamus by a tract of nerve cells. This construction allows the hippocampus to transmit memories to the proper hemisphere for long-term storage and retrieval, which plays an important role in both learning and remembering knowledge. Yet another function of this area is that of regulating emotional responses to everyday experiences. Surrounding the thalamus, the basal ganglia are composed of a group of nerve cells (Figure 2). This structure includes the globus pallidus, caudate nucleus, subthalamic nucleus, putamen and substantia nigra, which are accountable for commencing and coordinating body movements (http://www.ninds.nih.gov, 2007).

Recent brain imaging research with positron-emission tomography (PET) technology and MEG (magneto-encephalography) revealed a neural network for rhythmic entrainment with an emphasis on right lateralization in thalamo-parietotemporal loops with contributions from basal ganglia and hemispheric bilateral cerebellar structure. Limited prefrontal activation during rhythmic motor synchronization supports the concepts of direct sensorimotor coupling and immediacy of rhythmic auditory-motor entrainment. Supports for these concepts is also provided by the observation that many components of the neural synchronization network were already activated and entrained during simply listening to the rhythm (Thaut, 141-42).

Figure 2: The Human Brain (http://www.brainwave-entrainment.com)



Several different types of cells exist in the human brain; however, the most important cell of all is called the neuron or nerve cell. We owe much to these cells, as their signals are responsible for our thoughts, memories, emotions, movements and senses. Neurons are composed of three parts; bodies, dendrites, and axons. The nucleus, that produces the molecules the neuron needs to survive, can be found in the cell's body. Dendrites branch out from the body, as to receive information from other neurons. These

messages then pass through the body, down the axon, to be transferred to another neuron or to another cell in the body (http://www.ninds.nih.gov, 2007).

Usually a neuron is encompassed by other supporting cells. These cells act to insulate the axon, which in turn facilitates the signals received to move faster and to travel farther. The researchers at the National Institute of Neurological Disorders and Stroke state:

> Scientists have learned a great deal about neurons by studying the synapse—the place where a signal passes from the neuron to another cell. When the signal reaches the end of the axon it stimulates tiny sacs. These sacs release chemicals known as neurotransmitters into the synapse. The neurotransmitters cross the synapse and attach to receptors on the neighboring cell. These receptors can change the properties of the receiving cell. If the receiving cell is also a neuron, the signal can continue the transmission to the next cell (http://www.ninds.nih.gov, 2007).

Acetylcholine is known as an excitatory neurotransmitter, and true to its name it tends to excite the cells. This chemical delivers sodium ions to the nervous system, which in turn stimulates nerves, muscles, and glands. Those afflicted with Alzheimer's disease suffer from a shortage of acetylcholine (http://www.ninds.nih.gov, 2007).

Dopamine, an inhibitory neurotransmitter, affects mood, motivation, and feelings of pleasure. It facilitates the flow of information to the frontal lobe, thus those deficient in this chemical suffer from problems with their neurocognitive functions such as attention, memory, or problem-solving. Victims of Parkinson's disease possess a shortage of dopamine, which causes the muscular stiffness associated with the disorder (http://www.ninds.nih.gov, 2007).

Still another inhibitory neurotransmitter, GABA (gamma-aminobutyric acid) is a chemical that works to make cells less excitable. It controls muscle activity and plays an

important role in the visual system. Prescription drugs that increase the levels of GABA in the brain are often used to treat those with epilepsy who suffer from seizures, or those who suffer from tremors, which are characteristic of patients with Huntington's disease (http://www.ninds.nih.gov, 2007).

Chapter VII: Types and Effects of Brain Illness and Injury, and Music's Role in the Recovery Process

Every brain illness or injury is unique unto itself, much like all individual personalities are different the one from the other. Every patient needs to have their own in-depth evaluations, so that health-care providers may decide the best course of action for their therapy sessions. This usually consists of an interdisciplinary team, all employing a variety of techniques and treatments. There are few absolutes when recovering from neurological disorder or damage. For all we know about the brain, there is a great deal we have yet to discover.

A brain disorder can develop in a number of ways and can be accompanied by a variety of symptoms or deficiencies. Those suffering from age-related neurological conditions such as Alzheimer's disease experience varying degrees of dementia. Patients afflicted with degenerative diseases such as Parkinson's suffer from uncontrollable body movements. Those afflicted with neurodegenerative conditions like Huntington's disease experience both forms of dementia as well as involuntary body movements (Swiercinsky, http://www.brainsource.com, 2001).

One of the most common non-disease brain traumas that affect older adults is stroke. This condition occurs when an artery bringing blood to the brain experiences a blockage or when a blood vessel in or around the brain suddenly ruptures. Stroke victims experience varying symptoms, and the effects can range from mild to severe. With a

stroke, the patient's loss of function lies in the area of the brain affected, and the degree of deficiency is dependent upon the severity of the injury (Swiercinsky, http://www.brainsource.com, 2001).

The most prevalent, and usually preventable, way in which young adults suffer a brain injury is through an incident or an accident. Neurological damage might be caused by a localized open-head injury such as a penetrating bullet, or by a widespread closed-head injury often associated with a motor-vehicle crash. These serious head traumas are referred to as a 'Traumatic Brain Injury'. As with a stroke, a TBI patient's loss of function lies in the area of the brain damaged and the severity of an injury is dependent upon the forcefulness of the impact, as well as the immediacy of medical intervention (Swiercinsky, http://www.brainsource.com, 2001).

Patients afflicted with Alzheimer's disease suffer from a degenerative neurological condition that affects the brain's intellectual processes, i.e. memory, orientation, etc. This brain disorder is not known to affect a person's sensorimotor functioning. Alzheimer's patients lose their intellectual functioning gradually over time, though the progression of the disease and the diminishing of mental processes can vary greatly from patient to patient. As the clinical neuropsychologist Dennis P. Swiercinsky of Portland, Oregon states:

> …in all true cases of Alzheimer's disease specific structural changes occur to neural cells scattered throughout the brain. These changes render the cells incapable of transmitting nerve signals. As the number of these impaired cells increases, the functional consequences become more pronounced (http://www.brainsource.com, 2001).

Memory loss is often the number one indicator of the disease. Symptoms start with short-term memory loss and then progress to long-term loss, making it difficult for

patients to remember people and events from their past. Impaired judgment, confusion, and disorientation can make even the easiest of tasks challenging for one suffering from Alzheimer's (Swiercinsky, http://www.brainsource.com, 2001). "Music has been found to improve memory and reminiscence and help recollections from autobiographical memory. Preferred music related to patients' past, has been shown to help retrieval techniques on face-name recognition" (Ziv, Granot, Hai, Dassa, and Haimov, 329-43).

As Alzheimer's disease progresses, the person may experience anxiety, depression, delusions and/or hallucinations, and can also be troubled with personality changes and undue aggression (Swiercinsky, http://www.brainsource.com, 2001). Case studies have demonstrated the benefits of music therapy for Alzheimer's patients, with therapy sessions focusing on improvement of cognitive abilities and social skills, and attempts to reduce unnecessary agitation:

> Results showed both a significant increase in positive social behaviors and a significant decrease in negative behaviors related to agitation when music is played. Results demonstrate the contribution of music to enhancing general positive functioning in elderly patients with dementia, and reducing negative behaviors typical of their condition (Ziv, Granot, Hai, Dassa, and Haimov, 329-43).

Parkinson's disease is a neurodegenerative motor system disorder that affects body movement control. Symptoms include tremor or trembling of the limbs and face, rigidity of the limbs and spine, bradykinesia or slowed body movements, and instability in posture, balance and coordination. Much like that of Alzheimer's, patients lose their motor functions gradually, and the speed by which the disease progresses can vary. Neurologist John Morris at the Westmead Hospital in Australia writes:

> (Parkinson's disease) happens when the neurons or nerve cells that normally produce dopamine in the brain gradually die. The death of these

> cells leads to abnormally low levels of dopamine, a chemical which helps relay messages between areas of the brain that control body movement. Low levels of dopamine give rise to difficulty in controlling muscle tension and muscle movement, both at rest and during periods of activity (http://www.brainfoundation.org, 2003).

As impaired motor abilities become markedly worse, Parkinson's patients experience much trouble with the simplest of tasks such as walking, talking, and common daily activities. Other complications that may occur include emotional difficulties such as depression, trouble with chewing and swallowing, skin changes (dryness or excess oil), constipation and bladder problems, as well as various sleep disorders (Morris, http://www.brainfoundation.org, 2003). One symptom that is often difficult to treat is that of speech and voice disorders; "pharmacological interventions and traditional speech therapy have not proven consistently effective" (Haneishi, 273-90). Studies examining the effects of music therapy on speech intelligibility of patients with Parkinson's conclude,

> Singing naturally intensifies various aspects of speech production. For example, singing elicits a louder voice than does speech based on active respiration. Learning how to distribute the breath to sing a musical phrase may help patients develop ways to use their respiratory capacities. Diaphragmatic-intercostal breathing will expand the lower back ribs and will provide sufficient space for the diaphragm to support the tone production. Singing also can improve intonation because it incorporates pitch variability and range. Practicing songs at desirable tempos also might improve abnormal speech rates. Exaggerating consonants while articulating song lyrics may help improve speech intelligibility (Haneishi, 273-90).

Those who are affected by Huntington's disease suffer from a genetically inherited degenerative neurological condition that causes physical, mental, and emotional disorders. Doctors at the National Institute of Neurological Disorders and Stroke state:

> Huntington's disease (HD) results from genetically programmed degeneration of brain cells, called neurons, in certain areas of the brain. This degeneration causes uncontrolled movements, loss of intellectual faculties, and emotional disturbance. HD is a familial disease, passed from parent to child through a mutation in the normal gene (http://www.ninds.nih.gov, 2007).

The mutated gene from this inherited brain disease affects the nervous system by interrupting the production of the Huntington protein, of which is believed to play a vital role in brain development. Early symptoms of Huntington's disease may include balance problems and uncontrolled movements, both voluntary and involuntary. Other common problems include the onset of dementia, a decline in memory, judgment, awareness, decision-making, problem-solving, planning and speed of thought. It can sometimes be difficult to diagnose this disease early, as young patients "exhibit different characteristics than the symptoms of an adult" (Grob, 38).

Huntington's disease victims are aware of their physical deterioration, and some try to compensate by developing "coping mechanisms" in order to maintain their autonomy and preserve their ego (Grob, 38). Responses to rhythm can help therapists to "extinguish exceptional behaviors" (38).

> Paraverbal techniques using rhythmic, cyclic, and sensory (visual, kinesthetic, tactile, auditory, vestibular and proprioceptive) input, including dual dependent rhythmic motor tasks...have revealed inhibition of choreiform movements and increased fluidity in rigid movements...responses to music utilizing paraverbal/psychomotor techniques may yield further channel for exploration and application in rehabilitation and habilitation to an expanded spectrum of neurological involvement (Grob, 38-9).

Due to the knowledge of loss of function, some patients suffer from mood swings, irritability and depression. With the progression of Huntington's disease, persons

affected have trouble driving a vehicle, learning new tasks, focusing on intellectual ideas, and they cannot perform simple tasks such as walking, talking, eating, and swallowing (McCusker, http://www.brainfoundation.org, 2003).

A stroke occurs when an artery is blocked or when a vessel is ruptured, denying the brain a sufficient amount of blood. If the brain is without blood for a significant amount of time, this prevents the blood from transferring oxygen and nutrients. When deprived of these two necessities, the brain's cells cannot survive and they begin to die. Once lost, these cells can never be restored. Neuropsychologist Swiercinsky writes, "Characteristic symptoms of stroke are usually associated with interruption of blood supply to specific brain areas, changes in speech, weakness on one side of the body, visual disturbances, even vague confusion" (http://www.brainsource.com, 2001).

The most common problem that stroke patients suffer from is numbness or paralysis on one side of their body. Paralysis can lead to "spasticity", which causes patients to experience a limited range of joint mobility (Kim and Koh, 81-92). Spasticity can become a significant problem for stroke patients as it induces muscle and joint pain, and causes stiffness of the upper extremities (81-92).

> Given (the) positive effects of music in pain management tasks, stroke patients...benefit from using music during their physical rehabilitation. Music, with its expectable and regular beats as well as flexibility in tempi and styles, can help patients match their movements to the rhythm of their music, and pace them for their physical abilities. Several studies show that music has been used to increase stroke patients' physical functioning such as hand grasp strength and to facilitate gait training (Kim and Koh, 81-92).

Some other physical symptoms that a stroke victim may endure include dizziness, trouble walking, loss of balance or coordination, and severe headaches that seem to appear with no cause.

Stroke patients may also experience a variety of mental and emotional deficiencies as well. They can suffer from problems with their thought processes, their general awareness and judgment, their attention span, and their ability to learn and remember knowledge. Victims of a stroke also fall prey to emotional instability. Most patients find that they have difficulty controlling and expressing their emotions, and this in turn can lead to depression (Swiercinsky, http://www.brainsource.com, 2001).

Traumatic Brain Injury is the leading cause of death and disability in this country for persons under the age of 35, killing more individuals than all known diseases combined. Approximately 15% of the survivors are never able to return to their pre-injury lives. This type of severe head injury results in many physical, linguistic, cognitive, social, emotional and behavioral changes in an individual. A traumatic closed-head brain injury, one without penetration, can cause widespread and diffuse damage (Davis, Gfeller, Thaut, 227).

A closed-head injury can result from one or all of three external forces acting simultaneously or successively on the brain at the time of impact:

- a compression of brain tissue
- a tearing of brain tissue
- a shearing of brain tissue

When a head in motion is abruptly stopped, this causes the brain to impact the front of the skull. Then after collision, the head will rebound, causing the brain to impact

the back of the skull. This type of head injury has been termed a *coup-contrecoup injury*. Due to the back-and-forth head motion, the brain brushes up against the rough bones at the base of the skull. This motion causes brain stem damage that can leave the person in a comatose state - a prolonged state of unconsciousness without response to stimuli (Davis, Gfeller, Thaut, 227).

For the chance at optimum recovery, neurosurgeons must assess the injury to the patients' brain immediately upon arrival. Aside from the obvious conditions stated above, further complications can occur for a patient who sustained a closed-head injury. The brain can both swell and bleed, and if not surgically treated, the patient can sustain even further injury or, the worst of all outcomes, death (Davis, Gfeller, Thaut, 227).

Another factor that affects an individual's chance for optimum recovery is the amount of time the patient spends in a comatose state. The longer the patient is in a coma, the greater the chance of widespread and diffuse damage to the brain. The measurement tool used to evaluate what coma state a patient is in is the Glasgow Coma Scale (Figure 3). This scale clinically measures and numerically rates the coma state by examining three patient features: eye movement, motor response, and verbal response (Davis, Gfeller, Thaut, 227-28).

Figure 3: Glasgow Coma Scale (http://publicsafety.com/article/)

The GCS is comprised of three assessment criteria: best eye response, best verbal response, and best motor response. They are as follows:

<u>The Best Eye Response</u>:

1. no eye opening
2. eye opening to pain
3. eye opening to verbal command
4. eyes opening spontaneously

The Best Verbal Response:

1. no verbal response
2. incomprehensible sounds
3. inappropriate words
4. confused response
5. clear, orientated response

The Best Motor Response:

1. no motor response
2. extensions to pain
3. flexion to pain
4. withdrawal from pain
5. localizing pain
6. obeying commands

The score should be broken down into its core parts. For example, if the patient opens his eyes spontaneously (sore of four), responds verbally with inappropriate words (score of three) and responds by localizing pain (score of five), the overall Glasgow Coma Score should be presented as E4-V3-M5. Although the score is most effective when broken down into parts, the most common practice is to communicate an overall score, as in the previous example, where the GCS is 12. It is important to note that the lowest score possible is 3; a dead patient would have a GCS of 3.

Only thirty years ago, 90% of all traumatic brain injury patients died. With our advances in emergency care such as speedier rescues, medical technologies, and neurosurgical treatments, we are now able to save 50% percent of all brain injury victims. This may not always be a blessing, as it can be in some cases. Usually the quality of life for the brain injury victim is greatly diminished. Also worth mentioning is the often unbearable physical, mental, emotional, and financial strain that the families and friends of the victim must endure (Davis, Gfeller, Thaut, 227).

During the rehabilitation process, the behavioral deficits of brain injury patients are assessed in four major areas:

1. Cognitive Problems
2. Sensorimotor Problems
3. Medical Problems
4. Socio-emotional Problems

The cognitive problems that a brain-injured patient can experience are short and long term memory loss, expressive and receptive language inabilities, inattention and lack of concentration, and loss of problem-solving cognitive strategies. The patient can suffer from easy frustration, lack of focus, and problems with learning and retaining new information. Patients might also have a hard time following sequential directions. On rare occasions results may sometimes differ, but it is scientifically and medically agreed that left hemispheric brain injuries affect verbal and memory skills and right hemispheric brain injuries affect spatial and perceptional skills (Davis, Gfeller, Taut, 229).

The sensorimotor problems that a brain-injured patient can experience are an assortment of physical and sensory deficits, including auditory and visual nerve damage, resulting in impaired hearing and vision, and fine motor skill impairment. The motor skills affected are coordination and balance abilities, range of motion, physical endurance, muscle tone, and body awareness. When a patient injures the lower levels of the brain, inborn primitive reflexes, much like that of an infant, may suddenly reappear. Also, learned protective reflexes, such as maintaining balance, may be disrupted, causing motor performance limitation (Davis, Gfeller, Taut, 229).

The medical problems that a brain-injured patient can experience may further complicate the rehabilitation process. The most frequently encountered problems include heart conditions, seizures, hypertension, diabetes, or lung diseases. It is also common for

patients to develop depression that can lead to substance abuse problems (Davis, Gfeller, Taut, 229).

The socio-emotional problems that a brain-injured patient can experience are the result of the sudden life altering changes that one must undergo. Adjusting to these changes can cause depression, anxiety, low self-esteem, sexual dysfunction, or aggressive behaviors. Often a patient can no longer live independently, and must depend on a caregiver for assistance in regard to personal hygiene, dressing, feeding, employment, and transportation. Most brain-injured patients experience some change in personality. Some of the behavioral features that can be affected are:

1. Lack of initiative (to follow through with a task)
2. Inability to adapt behavior (in social or professional settings)
3. Impulsiveness and over-activity (inability to stop behavior)
4. Poor self-awareness (inappropriate social behavior)
5. Lack of foresight (and/or social judgment)

The frontal lobe of the brain is responsible for high-level intellectual, sensory, and motor functions. Patients who damage this part of the brain suffer from personality changes such as combativeness and emotional liability (Davis, Gfeller, Taut, 229-30).

If a patient is well enough to be aware of her or his situation and/or shortcomings, these life changes can prove incredibly frustrating. When patients realize that they do not have the same control they once had over their thoughts, words and actions, the resulting confusion can be devastating. Most brain injury survivors no longer enjoy the same level of mobility and independence, and they require assistance at all times. This can prove to be very taxing on those closest to them.

In his book *Rhythm, Music, and the Brain (2005),* Thaut cites numerous ways music therapy can be used in the rehabilitation of those suffering from neurological disorders. One such example that references brain injury in particular explains the "beneficial effect of musical stimulation for overcoming visual neglect as a result of right hemispheric lesions due to...traumatic brain injury" (77).

> Music stimuli were superior to other sensory and cognitive cues, such as instructions and speech or tactile cues. The researches' rationale focused on the...arousal effect of music on the right brain hemisphere... This rationale would also be well supported by the theoretically established link between arousal and neglect in general... (Studies) have shown that unilateral neglect can be dramatically altered by changing the functioning of the brain's arousal system... (Studies) have also shown that auditory stimuli can enhance visual perception in neglect states. ...data point to multi-sensory neuronal integration... These examples provide another good illustration of how a neuroscience-guided understanding of auditory and music perception can lead to a profound new understanding of the role of music and sound in neurological rehabilitation (78).

In the next chapter we will explore how music therapy can be used to treat patients suffering from neurological disorders. It is thought that future advances in neuroscience may help to progress the effectiveness of the music therapy field. "Neuroscientific research in music is giving rise to new ideas, perspectives, and methods; they seem to be promising prospects for a possible contribution to a theoretical and empirical scientific foundation for music therapy" (Hillecke, Nickel, and Bolay, 271).

More thorough case studies examining the benefits of music, as used to treat brain injury or illness, can help to further prove music therapy's effectiveness. With continued research, we will better understand how music is able to facilitate the recovery of once-lost brain functions.

> Neurophysiological studies have shown that music can arouse and excite the spinal motor neurons mediated by auditory-motor connections at the

> brain stem... Patients with neurological movement disorders can benefit from this effect of music and rhythm to retrain their motor functions... Thus, music provides a stimulus that substitutes for compromised internal functions, accesses compensatory networks in the brain, and may help build new pathways, thus shaping the plasticity of the brain (Thaut, 79).

With a greater use of music as therapy, perhaps we can help to foster a quicker rehabilitative process for brain-injury patients, as time plays an essential role in helping these individuals to re-enter society with as high a level of functioning as is possible.

Chapter VIII: Music Therapy Practices for the Treatment of Neurological Trauma

There are five general ways that therapists can aid a patient in the process of neurological recovery and rehabilitation (Davis, Gfeller, Thaut, 230).

1. Prevent any further complications: The choice of treatment must prevent the patient from suffering even more complications to the already existing injuries, such as illness, muscle weakness, or contractures - These problems can interfere with or hinder the natural recovery process.

2. Teach new adaptation strategies: The therapy used should teach the patient adaptive strategies and techniques, so that the unaffected areas of the brain/body can take-over for the affected ones.

3. Retrain the nervous system: Therapists must employ specific exercises to retrain the areas of the nervous system that were affected, such as deficiencies in a patient's speech and motor abilities or performance.

4. Ensure use of physical aids: Caregivers should make available, and teach the proper use of, physical aids – e.g. walking sticks, wheelchairs, lifts, and ramps.

5. Exercise the affected limbs: Physical rehabilitation therapists must try to prevent the "learned non-use" of limbs, by first determining the possibility of limb movement and then encouraging its use.

When a therapist assesses a patient with a neurological disorder, the efforts in rehabilitation are usually grouped into four major categories: cognitive deficits, communication deficits, physical deficits, and socio-emotional deficits. We will examine the general focus of therapy for each category, as well as how the music therapy field approaches the rehabilitation process for these neurological deficiencies.

General Therapy for Cognitive Deficits

In the rehabilitation of cognitive deficits, the two major efforts in the clinical setting are: memory training and attention/perception training. For memory training, therapy methods make use of compensatory external and internal aids. External aids could be a diary, a wristwatch, an alarm clock, a computer, or the like. An example of an internal aid would be visual imagery, rhyming, singing, or grouping related information together, known as chunking (Davis, Gfeller, Thaut, 231-32). For attention/perception training, therapy methods focus on the use of the five senses in the patients' perception of the world, and the patients' ability to act in an appropriate manner with different stimuli. Attention training may focus on proper attention span and appropriate attention strategies. A perceptual retaining program can consist of body awareness training, as well as auditory, visual, and tactile training. With neurological disorders, it is common for patients to have visual inattention problems or sensory neglect syndromes. Cognitive training teaches patients to be aware of their deficits, and helps them to better adapt to their environment (Davis, Gfeller, Thaut, 232).

Music Therapy for Cognitive Deficits

Music therapy techniques used to regain cognitive deficits are classified as: sensory stimulation, reality orientation, attention training, memory training, and perceptual training.

- Sensory Stimulation – This technique employs music to activate the senses and to elicit a response from a comatose patient.

Often therapists will use particular music with which the patient was familiar before the injury in order to evoke a reaction (Davis, Gfeller, Thaut, 234).

- Reality Orientation – This technique is usually used in the early stages of recovery, when a patient is showing signs of confusion and agitation.

Therapists use "non-threatening, pleasant, and familiar sensory stimulation" to help relax the patient, and patient-preferred music can be used to decrease anxiety and to orient the patient to her or his surroundings (Davis, Gfeller, Thaut, 234).

- Attention Training – This technique is based on the idea that the patterns in music are effective, consciously and subconsciously, in the focusing and organizing of our attention.

For instance, rhythmic, dynamic, melodic, and harmonic musical structures can be used to train a patients' ability to identify and differentiate between temporal, spatial, and/or visual cues. An attention technique could consist of having the patient recognize rhythmic or melodic patterns, or remember spatial patterns of tone sequences (Davis, Gfeller, Thaut, 235).

This idea can then be transferred over to non-musical activities. Music can aid in gaining and sustaining patients' attention, and can help to improve their ability to focus. Important functional information can be introduced to patients in the form of songs, which work exceptionally well as mnemonic devices. By playing instruments in a bilateral fashion, music's tasks and cues can be effective in training awareness of a neglected body side. During a movement exercise, music can be used for patients to practice visual scanning, by therapists sounding music from different directions and asking the patients to turn in the direction of the sound. Therapists also use music in a nonspecific manner, as background stimulus, to improve attention and motivation while helping patients to relearn everyday life activities (Davis, Gfeller, Thaut, 235).

- Memory Training – This technique is founded on the well-documented research of music's effectiveness as a mnemonic device.

Musical rhythm and melody have been proven to help us organize, sequence, and remember verbal information, and the rhyming of words in music is another way to aid the recall of information. Chunking is a memory technique often used in music therapy, and one that most of us used as children. This technique is the organization of small pieces of information into larger units remembered as a whole. Preschool or kindergarten students learn the alphabet as 4 chunks of letters, instead of 26 individual letters. Even adults use this system of recall when learning phone numbers – as 3 chunks of numbers instead of 10 separate ones, or when remembering Social Security numbers – as 3 chunks instead of 9 (Davis, Gfeller, Thaut, 235).

> An examination of music cognition research in the areas of attention and memory illuminates some important points for biomedical theories of how music can access remediation cognitive functions. A large and consistent body of research in musical attention has elucidated the role of rhythm in tuning and modulating attention in music...In this view, rhythmic patterns drive attention focus by interacting with attention oscillators via coupling mechanisms...evidence for divided attention mechanisms in song between processing of lyrics and processing of music...laid out some of the fundamental organizational processes for memory formation in music, based on the structural principles of phrasing, grouping, and hierarchical abstraction in musical patterns, similar to temporal chunking principles in memory formation (Thaut, 74).

- Perceptual Training – This technique uses music to evaluate the auditory perception of brain-injured patients.

In most neurological assessments, therapists will produce different rhythms and then patients are asked to reproduce the sounds they hear. This is a widely used assessment tool. Once a certain deficiency is determined, music is then used to try to regain those abilities lost. Being able to discriminate auditory perception is very important when comprehending speech, and when understanding other environmental sounds as well. When speaking, one must be able to discriminate sounds in relation to pitch, volume,

timbre, and time. If a patient is suffering from a loss of speech capacity, music therapy can be effective in helping a person to improve or regain their speaking abilities (Davis, Gfeller, Thaut, 235-6).

General Therapy for Communication Deficits

In the rehabilitation of communication deficits, the major effort in therapy is correcting what is known as aphasia. Aphasia is the inability of speech, and is the most common communicative disorder in brain-injured persons. There are two types of aphasia. Depending on the site of the lesion, "expressive" or "receptive" channels of verbal communication can be damaged, and the disorder will be categorized as such.

There are several techniques used to improve communication abilities. Some general techniques used are PACE (Promoting Aphasics Communicative Effectiveness), Amerind (gesture system), Bliss (visual symbol system), and visual communicative charts. These techniques are mostly nonverbal in nature, focusing on visual gestures and symbols, and they tend to emphasize meaning rather than spoken language (Davis, Gfeller, Thaut, 232).

Therapists use other techniques to promote conversational language. The deblocking technique attempts to open the communicative channels by introducing facts in an undamaged mode first, before introducing them in the damaged mode. An example of this is a patient who has trouble understanding what they read. They could have the words read to them first, before seeing them in print. Another technique used to promote spoken language is the stimulation approach. This approach tries to trigger speech reflexes by asking patients to complete automatic phrases, or previously learned songs or rhymes (Davis, Gfeller, Thaut, 232).

Such communicative disorders as dyspraxia and dysarthria are not yet fully understood. Dyspraxia is when the sequence of spoken language is disturbed, and dysarthria is when spoken language is slowed and slurred. When working with patients suffering from dysparxia, therapists usually use the reflexive speech and stimulation approaches for treatment. For those that are afflicted with dysarthria, therapists often focus on breath control and rate of speech (Davis, Gfeller, Thaut, 233).

Music Therapy for Communication Deficits

Neurological theories on the MIT technique were first founded on the assumption that by singing and using the right undamaged hemisphere, the brain could bypass the speech impairment of the left damaged hemisphere. However, using the latest neuroimaging tools, we have discovered that the once damaged areas of the left hemisphere were "reactivated" upon successful completion of this technique (Davis, Gfeller, Thaut, 236).

Music therapy is used to treat the communication deficit aphasia with two approaches, melodic intonation therapy (MIT) and nonpropositional speech stimulation. MIT makes use of the patients unimpaired singing abilities. Simple phrases pertaining to activities of daily life are first sung, and then chanted to melodies and rhythms that resemble normal speech intonation patterns. This therapy works best with patients who can comprehend auditory stimuli, but cannot verbally express themselves - known as "expressive aphasia" (Davis, Gfeller, Thaut, 236).

> Another important inquiry...concerns whether changes in affective content and structural coherence of musical expressions...can be related to an ability to experience, identify, and express feeling states. This research builds on models paralleling and contracting the structure and content of spoken language and nonverbal musical language. The outcome of this

> research could be a communication model in music improvisation that assesses coherence in musical expression as a reference to nonmusical affective expression and cognitive organization of thought (Thaut, 122-23).

The other music therapy technique used to treat aphasic patients is non-propositional speech stimulation. This approach is founded on the observation that aphasics cannot produce a voluntary verbal response, but can sometimes produce an involuntary verbal response upon interaction with certain stimuli. This involuntary response is much like the almost automatic speech phrases that everyone says on a daily basis i.e. "How are you?" …and… "Good morning!" We say these phrases nearly everyday with little thought to their actual meaning. Music therapists use this approach to trigger automatic speech by singing common songs with the patient and using lyric completion: "Silent Night, Holy _____" & "God Bless _____" (Davis, Gfeller, Thaut, 236).

Since communication disorders such as dyspraxia and dysarthric are less understood than that of aphasia, the techniques used are not as clear. Some therapists use the MIT and stimulation approaches with occasional success. Other techniques used for dyspraxia patients practice positions of oral apparatus and muscles such as the lips, jaw, and tongue. Therapists use wind instruments and vocal exercises to train oral motor movements and to practice sound production. Yet another technique used for dysarthric patients is an approach that utilizes vocal exercises to improve breath support and synchronization of breathing. Also, chanting exercises are used to work on proper speed, articulation, and inflection of speech (Davis, Gfeller, Thaut, 237).

General Therapy for Physical Deficits

In the rehabilitation of physical deficits, a therapist will mostly focus on the patients' recovery of walking abilities, and the ability to use arms and hands independently of each other. Most all of the techniques, for movement disability and muscle dysfunction, were conceived of by physical and occupational therapists such as the Bobath approach, the Rood method, and the Brunnstrom approach. These techniques are basically exercise programs that "normalize muscle tone and posture, work through abnormal movement reflexes, regain range of motion and strengthen muscle, and develop movement coordination" (Davis, Gfeller, Thaut, 233).

Another technique used by physical therapists is the biofeedback method. This more recent approach uses visual and/or auditory feedback to detect unconscious muscle activity. Using this technique, therapists can help patients to regain control over weakened muscles. Most therapists agree that active and repetitive exercises should be used in physical rehabilitation. This system-based approach "has changed some of the more traditional views", and is considered more effective in rehabilitating motor functioning (Davis, Gfeller, Thaut, 233).

Music Therapy for Physical Deficits

Music as used to rehabilitate those suffering physical deficits is one of the well-known and well-documented benefits of music therapy. In order to effectively execute physical activities, it is imperative to possess proper coordination and appropriate timing of body parts. Muscles in the body must all move at the right time, in relationship to one another, to correctly complete physical tasks. Music therapy can help patients to regain

loss of physical mobility and independence by integrating movement with music. (Davis, Gfeller, Thaut, 238).

When working in physical rehabilitation, music therapists use two concepts 1) movement to music and 2) movement through music. In the movement to music method, music is used like a metronome that accompanies the movement. The music therapy techniques for physical rehabilitation are based on 3 physiological mechanisms:

- Patterned Sensory Stimulation - Since music is organized in rhythmic patterns, accents and phrases become predictable timing cues. This helps patients to plan, program, and execute sequences of complex movement patterns.

- Rhythmic Entrainment - When one moves in synchrony with a rhythm, the strategy of the brain is not to synchronize the motor response to the beat, but to scale the duration of movement to the duration of the beat interval.

- Audiospinal Facilitation - When sound, organized in a rhythmic pattern, activates the motor system in our central nervous system, our muscles will becomes activated in synchrony and this rhythm helps the muscles to anticipate and time the movement properly.

In the movement through music method, musical instruments are used to exercise the patients' physical functions, such as that of the fingers, hands, arms, shoulders, legs, and oral motor muscles.

> ...motor learning and motor memory in music are based...on pattern organization of movement sequences, especially of the arms, hands, and fingers. Patterned, rhythmically cued repetitions of functional movements have been shown to be very useful in physical rehabilitation, suggesting that the implementation of a musical motor learning model can be of great benefit to the recovery of motor function (Thaut, 124).

These techniques can improve specific physical movement damage, such as the patients' inability to move their fingers independently (Davis, Gfeller, Thaut, 239).

As well as the three physiological mechanisms above, there are three others that are specifically for the use of musical instruments:

- Auditory feedback and purposeful movement - When playing a musical instrument, a patient receives immediate feedback if their physical movement was performed properly. Receiving immediate rewarding results can enforce goal-oriented performance.

- Affective/motivational arousal - Upon selection of the appropriate instrument, most patients will enjoy playing it. The instrument becomes an important tool to stimulate a patient's motivation for the rehabilitation program.

- Motor memory - When producing rhythmic and melodic patterns while playing a musical instrument, this helps the patient remember the muscular movements that produced these patterns. This can help the nervous system to remember movement sequences.

Music therapists use all the above mechanisms to develop scientific and effective techniques (Davis, Gfeller, Thaut, 239-40). All of these applications can be grouped in to three categories of treatment:

- Rhythmic Auditory Stimulation - RAS is a technique used to rehabilitate movements that are intrinsically rhythmical. This technique is mostly used for gait, because it is one of the most important rhythmical movements.

- Patterned Sensory Enhancement - PSE uses the rhythmic, melodic, harmonic, and dynamic elements of music to supply temporal, spatial, and force cues for movements that reflect functions in everyday life.

- Therapeutic Instrumental Music Playing - TIMP is a technique that uses the playing of instruments to exercise functional movements and train gross and fine motor skills by emphasizing range, endurance, strength, dexterity, and coordination.

General Therapy for Socio-emotional Deficits

In the rehabilitation of socio-emotional deficits, a therapist helps the patient to adapt to their new disabilities (Davis, Gfeller, Thaut, 233-234). The four stages in adapting to lose of neurological function are:

1. Crisis - This stage is characterized by shock, by confusion, and by a high level of anxiety.

2. Treatment - In this stage the patient usually develops high expectations of recovery, coupled with the denial that the disability is permanent.

3. Realization of Disability - This stage usually coincides with discharge from the hospital or active treatment.

4. Adjustment - In this stage the patient has adopted and adjusted to a new lifestyle, where she or he finds ways to contribute to the family life and to participate in occupational and leisurely activities.

Music Therapy for Socio-emotional Deficits

Music therapy is used to meet the socio-emotional needs of brain-injured individuals in one of three ways. At first, a music therapist will try to lessen the anxiety and modify the depression that a patient may feel. Pleasant musical experiences can foster relaxation, reduce anxiety, and heighten mood. Secondly, music therapy techniques can help patients adjust to their new way of life. A music therapist might use music to assist a patient in expressing emotions, lessoning fear, or inducing hope. Third, a shared musical experience with a group can satisfy a patient's need for social interaction. Being a member of a support group can greatly facilitate recovery efforts (Davis, Gfeller, Thaut, 240).

> Examples of mediating models in the affective domain are studies that pursue questions regarding affect modification through musical mood induction/vectoring and its role in controlling behavior. As an example, the associative network theory of mood and memory...provides an interesting framework for determining how mood states can determine access to thoughts, memories, and behavior evaluation...research has shown that changing mood states can facilitate cognitive reorientation. ...musical mood responses are stable and generalizable enough to shape and select access to specific nonmusical thoughts, memories, and behavior choices. Preliminary evidence shows that music is an efficient mood induction stimulus and that musical mood induction can influence

> cognitive reorientation, thus facilitating access to desired thoughts and/or memories outside the musical context...(Thaut, 122).

The rehabilitation of brain-injured patients is carried out by an interdisciplinary group of people. This group is mainly composed of physicians, psychologists, social workers, and specialists. These specialists can include physical therapists, speech pathologists, occupational therapists, and other related disciplines, such as music therapists. Music therapy is shown to be very useful in an individual or group setting, and is easily made available for inpatient or outpatient recovery efforts (Davis, Gfeller, Thaut, 234).

Music therapy itself is trans-disciplinary in nature (Figure 4). Perhaps researches should work more closely together; combing their various approaches and/or methods: quantitative, qualitative, biological, psychological, or sociological (Hillecke, Nickel, and Bolay, 277).

> The (music therapy) field overlaps with a wide spectrum of scientific areas, including mathematics, natural sciences, behavioral and social sciences, as well as the arts...Therefore the study of music and music therapy needs to be multidisciplinary as well as theoretically and scientifically pluralistic (Hillecke, Nickel, and Bolay, 275).

Figure 4: Music Therapy Research, A Multidisciplinary Field (Hillecke et al)

Music therapy's advantageousness alongside other medical treatments is apparent, but can we prove that music therapy in and of itself is effective for neurological rehabilitation, or does the very interdisciplinary nature of the music therapy process make it impossible to consider it as "in and of itself"? Can we produce the same results without the aid of other therapies? Is the incorporation of music in the clinical setting only making it easier for already existing types of therapies to be more effective? Some might answer yes to the last question posed, citing that music's wildly interdisciplinary nature fosters little advantage in isolation.

Most of what we know about how the brain processes information has been learned through studying those who survive a head injury, with scientists focusing on the particular area of the brain injured and the subsequent deficiencies that follow. Though

we can deduce what parts of the brain control which functions, we don't yet fully understand how the different parts of the brain work together to complete tasks. Brain plasticity is another area of brain research that is not yet fully understood. This refers to how the brain adapts in response to learning new information, or relearning old information as in when recovering from a head injury (http://kc.vanderbilt.edu/kennedy/, 2008).

According to researchers at the Vanderbilt Kennedy Center for Research on Human Development, "Plasticity refers to how circuits in the brain change--organize and reorganize--in response to experience, or sensory stimulation." Concerning brain plasticity, music therapist Cam Newton quotes neuroscientist Oliver Sacks as saying, "I regard music therapy as a tool of great power in many neurological disorders – Parkinson's and Alzheimer's – because of its unique capacity to organize or reorganize cerebral function when it has been damaged" (http://www.camnewton.com/, 2003).

Some believe the idea of plasticity to be the new frontier in brain research that can help to progress the effectiveness of music therapy techniques. Further studies of how the brain adapts in response to musical stimuli, might very well provide the data scientists need to prove that music's medicinal values can aid in the healing of sick and injured individuals. But perhaps proving music therapy's effectiveness lies not in the realm of quantifiable scientific data.

> Nearly half a century of research in music therapy supports the effectiveness of music therapy in...motivating people to cope with treatment; providing emotional support for clients and families; providing an outlet for *expression of feelings* [italics mine] and providing process oriented psychotherapy (AMTA Membership Brochure, 1997).

We might better suit our search for proof by exploring music's humanistic tendencies; or more specifically, the emotional responses and behavioral reactions that so often accompany the composing, performing, and/or appreciating of musical sounds.

> The...ingredient is called *emotion modulation* or the *emotional factor*: The basic assumption is that music (more than other human experiences) has the power to modulate emotions. Not only basic but also complex emotions, like national sentiments, can be stimulated by music...This factor...includes direct emotional activation as well as the recall of emotional events associated with musical and auditive experiences. Emotion modulation is discussed in nearly all music therapy approaches, but empirical knowledge is still rather limited... (Hillecke, Nickel, and Bolay, 276).

Chapter IX: Music, Aesthetics, Emotions, and Healing

Physicians and scientists have discovered the strong connection between mind and body regarding our overall well-being, and most would agree that our emotional states have a direct affect on our physical bodies. A healthy state of mind can facilitate a speedy recovery from an injury, can make us less susceptible to an illness, or can help us to fight off an infection. Our emotions are inexplicably linked to our physical health, but what role does music play in our ability to come to terms with or to respond to our emotions? Can one experience human emotions through listening to music? And if so, can identifying with these musical expressions somehow help us to heal?

Music's ability to have an impact our emotions is rarely questioned. Though the power of music to stir our emotions is not often challenged, there is not universal agreement on how we hear or feel these emotions when listening to music. Do we hear emotions in the music itself, or do we feel emotions in response to the connections and/or associations that we make with the music we hear? Can we harness music's emotional properties and exploit its therapeutic values in a clinical setting?

In the 1970s, Berlyne published the book, *Aesthetics and Psychobiology*, which offered a framework in which to better understand the relationship between our perception and our behavior, in response to artwork (Thaut, 19). He postulated that how we perceive artistic value or worth had a direct effect on our emotional and behavioral responses (19). He attempted to illustrate this affective-aesthetic relationship by

developing “an understanding of how perceptual variables in artworks can influence physiological variables (arousal) and their associated behavioral states (activation)...” (19). Berlyne suggested that art may have a profound effect on our brain and behavior, in that perception is an intrinsic process of the human brain (19). Thaut explains,

> These views have been in many ways confirmed and considerably expanded through recent developments in brain research in the arts, which has been dominated so far by music-related studies...the continuing scientific pursuits of questions and models of study in music must be closely linked to a complex understanding of music and aesthetic theory. Only such linkage can yield insight into the nature and meaning of music, as well as into what we can learn about the brain from music (19-20).

The study of music perception/cognition is comparatively new, and is arguably related as much to aesthetic philosophy as it is to clinical research. Curtis Roads from the University of California states,

> Music perception is an extremely complicated cognitive activity. To fully explain the psychophysics by which music transforms the thoughts and emotions of a listener remains a distant goal. Nonetheless, scientists have harnessed high-technology tools in a search to unlock the mysteries surrounding the relation between consciousness and sound. But aesthetic experience cannot be distilled to a process that is triggered by a specific stimulus. Specifically, there is no accounting for taste…from the neuroscience perspective (Roads, 999: 302).

In the study of aesthetics, one of the most debated arguments is whether or not the musical arts can express human emotions. Philosophers and aestheticians have considered whether there is anything inherent or intrinsic in music’s organization of sounds that has the ability to portray human emotions. Or do organized musical sounds merely illicit certain emotions in humans by way of our already existing associations?

Either on a conscious- or subconscious-level, as a means of survival we all have the need to make sense of our world by comparing and contrasting our current situations

to our previous ones (http://www.uea.ac.uk, 2008). The psychologist Jean Piaget's Schema theory illustrates this idea. Researchers at the University of East Anglia explain,

> Piaget regarded knowledge as a process rather than a state, seeing it as a "relationship between the knower and the known" (Miller 1993:p. 36) with what is known changing as and when the knower does...Piaget regarded a schema to be a kind of mental structure that enabled an organism to adapt to the environment. People strive towards achieving equilibrium in their learning by balancing between assimilation and accommodation. It is a dynamic state and reflects the (person's) ability to organize and relate (http://www.uea.ac.uk, 2008).

This theory suggests that we are all a product of our past experiences. The same could be said for the associations we make with any type of art, whether we connect to a work in a positive or negative manner. It is in this regard that the relationships we make to the arts are especially powerful.

This power stems in part from the personal freedom that art can bring to life. Every person is free to develop their own interpretations of a work, by making their own connections to, or associations with, a particular piece. One person can be deeply touched by a piece while another may feel nothing, or nearly so. Artworks afford us the freedom to relate to or identify with a piece in such a way that makes sense to us, that helps us make sense of our life, that helps us make sense of the world.

Scholars in the academic world have discussed the philosophy of music for thousands of years, dating back to the ancient Greeks (Meyer, 1). In our time, the music theorist Leonard Meyer pioneered the return to the debate concerning music's expressiveness in *Emotion and Meaning in Music* (1956). Though written half a century ago, this work is still of great importance and relevance to today's discussion of aesthetics in music.

Most agree that music possesses the power to either convey or elicit emotions, but the reasons as to *how* or *why* this takes place vary. Absolutists argue that meaning in music grows solely out of the understanding of the relationships in the context of the musical work itself, whereas Referentialists believe that music has a way of communicating extra-musical meanings, such as concepts, agents, actions, characters, personae, or states of mind. Though there exists several schools of thought in relation to the meaning of pure music, their general ideas tend to be more similar in fashion than they are different. Jerrold Levinson agrees that "…much of the interest of music is wrapped up in what it intimates of human gesture, feeling, and agency" (Levinson 77-220, Meyer 1-2).

Meyer is careful to note that the distinction between these two views does not correspond to the relationship between the commonly held aesthetic positions known as Formalist and Expressionist. He claims that these views are not "mutually exclusive", and "that they can and do coexist in one and the same piece of music." Still further, he states that both Formalists and Expressionists may belong to the Absolutist group, and that members of the Expressionist group may either be Absolutist or Referentialist in nature (Meyer 1-3).

In his treatise, Meyer is primarily concerned with investigating the above concepts of the Formalist and Absolute Expressionist views. He examines both these positions and brings to light their inseparable relationships in regards to music's emotional meanings. He believes these sides should be allies rather than adversaries, "the same musical processes and similar psychological behavior give rise to both types of

meaning; and both must be analyzed if the variety made possible by this aspect of musical experience is to be understood" (Meyer, 4).

Levinson defines expression as "something outward giving evidence of something inward (or) the manifesting or externalizing of mind or psychology". He maintains that expression consists only of "psychological properties…pertaining to the mental states of sentient creatures", yet he states that he believes that musical works can achieve expressiveness without their "literally having inner lives". He believes that to hear music as expressive one must hear music as if it were personal expression. Otherwise put, he argues that music's fundamental expressiveness lies in our being able to hear it as the expressing of some emotion. In reference to the connection between physical gestures and expression, he states that the movement we hear in music is representative of what the listener hears the music doing or portraying (Levinson, 192-205).

Levinson explains that musical expression must be modeled on human expression in that our states of mind are somehow revealed through the use of musical gesture. Furthermore, he believes that hearing musical expression requires the listener to hear an expresser or an agent in the music, which he refers to as a musical persona. He believes that earlier proposals that give sole credit to the idea of *sui generis* mode of expression of emotion are questionable, noting criticism that "we can form no conception of a mode of expression declared to be *sui generis*". He insists that this theory of musical expressiveness is a part of the whole, stating that its merit lies in it being an afterthought or reflection, and that this view does not give "part of the content of the core experience of hearing the music as…an expression…" (Levinson, 192-205).

In response to Malcolm Budd's account: "A stretch of music is expressive of E if one hears the music as sounding like the way E feels, or perceives a likeness between the music and the experience of E, and it is correct to do so", Levinson disagrees with this view and explains that it is a cross-categorical perception, stating that one can "notice the likeness between the two and yet not see the one in the other". He notes that resemblance-based theories do not explain what constitutes musical expression nor do they provide proper analysis of musical expressiveness (Levinson, 192-205).

As for the account of Stephen Davies: "Emotion words used to describe appearances, whether in persons, natural objects, or works of art, are parasitic on the use of such words to refer to felt emotions…emotion words describe emotion-characteristics-in-appearance."…"P is expressive of E if and only if P exhibits an emotion-characteristic-in-sound associated with E…", Levinson contends that passages of musical emotion-characteristics-in-appearance are not precisely the appearance of a person's facial expression or body language, nor are they indicative of a person's behavior at any given moment in time. He points out that there is no real correlation between behavioral appearance-characteristics and that of musical appearance-characteristics (Levinson, 192-205).

Levinson admits there are objections to his views, the most common being that not all competent listeners "hear or imagine personae in music"; however, he believes that listeners are not always explicitly aware of the personae that they are hearing in the music. Some aestheticians think that his "hearability" as a benchmark for real expressiveness cannot "do the work that is required of it

or…is called upon to do too much work". Others question the validity of the qualified listener, or as the author puts it, the properly back-grounded listener who, with minimal musical competence, can come to a general consensus when it comes to musical expressiveness (Levinson, 192-205).

Yet another objection argues that listeners are required to literally conceive what "expressing emotion through music instead of behavior would amount to". Levinson responds that his account only requires that listeners are able to imagine music to be an expression of emotion. On the topic of appearance of emotion in music, Derek Matravers thinks that the philosophical discussions have reached an impasse, and the next direction is not so clear (Levinson, 192-205).

Many classically trained musicians, who have studied music in theory and practice, almost unwittingly take the idea of musical feeling for granted. Most do not give sufficient thought to precisely why they believe emotions are portrayed in music, nor do they attempt to conceptualize how they think these musical emotions exist. Musicians usually accept the notion of musical expressiveness as a given, and rarely give the idea any further thought or investigation.

Let us consider how emotional expressiveness in music can present itself in threefold fashion. The most common way that we perceive extra-musical ideas in music is by making associations with or connections to our passed life experiences. Yet another way emotions are heard in music is when the melodic and harmonic structures create a musical representation of our mental, emotional, and physical states. And still further, music is able to abstractly imitate the

sounds of the human voice that typically accompany our deepest thoughts and strongest feelings.

We all make emotional connections to works of art, whatever the discipline. With the musical arts in particular, we all make very personal associations with certain pieces of music, whether popular or classical in style. As Higgins describes, "musicians and other knowledgeable listeners form something like personal relationships with particular works of music." When we listen to a song repeatedly during one point in our lives, we directly or indirectly connect certain people and places to the music itself. Upon hearing that song again years later, it instantly takes us back to that time in our life and we remember everything; where we lived, what car we drove, where we worked, who we were dating et cetera (Robinson, 2005).

This song whether loved or hated takes us to a far away time and place, much like the reading of classic literature or the watching of an epic drama, and we are instantaneously reminded of our past memories in vivid detail. But beyond our own associations, can musical sounds themselves accurately express human emotions by way of their temporal patterns and harmonic relationships? Warren Shibles explains, "…music can suggest and encourage the desirable and the undesirable through its associations with the presence or lack of: balance, harmony, timbre, tenderness, order etc..." (146-171).

Let us briefly examine music theory; or more specifically the harmonic structures involved in western music. Feibleman considers harmony to be "a quantitative as well as a qualitative relation. It may be considered…to be that

right relation between tones which depends upon the due proportionality of a succession of chordal elements." Tonal music employs what musicians call consonance and dissonance respectively, in relationship to the melodic intervals and harmonic configurations used in a piece, a movement, or a phrase (336-352).

One should be reminded of the root word's meaning, and what the prefixes con- and dis- can be taken to represent, in a non-musical sense. The root of the words consonance and dissonance obviously refers to that which produces sound. For the sake of simplicity, let us take the prefixes con- and dis- to represent the words concord or accord (agreement) and discord (disagreement). The American Heritage Dictionary (Fourth Edition, 2001) defines consonance as "In agreement...harmonious in sound" (190), and dissonance as "A harsh, disagreeable combination of sounds..." (251).

However, various cultures, from the past to the present, have and have had different scale systems; and what might seem dissonant to one, may appear consonant to another. As James K. Feibleman explains,

> The sense of concord depends upon perspective, and the perspective of every appreciator of music is determined by the given frame of reference of his culture. Given the culture, the frame of reference is determined; and given the frame, the perspective is absolute (336-352).

In Western music, the frequency relationships of the notes in a minor piece, whether played consecutively or simultaneously, are naturally unstable and thus create tension. When this musical tension is resolved by way of some harmonic cadence, the aftereffect is that of a release. We can recognize this building of tension and then subsequent release in musical art works, known to music theorists and students by the

terms of suspension and resolution. According to Matravers, "The tensions and releases in the music directly and immediately influence the feeling" (2003, 353-63).

When we hear these musical ideas in a piece of music, whether popular or classical in style, we can identify with them in a way, as they somehow mirror (in an abstract fashion) our own life experiences consisting of difficult struggles and possible solutions. This is not to say that we can hear actual human emotions in music, but rather that we can hear a musical representation of those human emotions (Davies 2006, 179-91). Stephen Davies states,

> We experience movement in music…from high to low or fast to slow…waxing and waning of tensions generated variously within the harmony…this movement is like human behavior…(2006, 179-91).

Music has the power to make us hear and/or feel sadness in response to the articulations, rhythms, tempo, chord progressions, and dynamics used. However, those who study music's aesthetic qualities might argue that music cannot literally make us feel sad in response to the sounds, unless of course we attach some extra-musical idea to the music itself (Davies 2003, Sharpe 2000). Nick Zangwill reminds us that,

> ...it cannot be denied that we *sometimes* feel emotions while listening to music. The music may remind us of some emotionally charged event...But in *this* purely casual sense, sad music can make us happy and happy music can make us sad" (2004).

Though many agree with the particulars of likeness and portrayal that make up the inference- or resemblance-based musical expressiveness theories, some do not believe that either of these theories' syntaxes can properly explain the nature of emotion in music. I would argue that the utmost recognition of musical emotion lies in the form of an abstract imitation of the human voice. Music can inexactly imitate the aural sounds

humans usually produce, in correspondence with their emotional thoughts, feelings, or moods. Though many of today's philosophers would adamantly disagree, Trivedi states,

> …it seems odd to think we can literally attribute emotions and other mental states such as moods and feelings to inanimate things such as music. To say music literally is sad seems to imply that music literally or really has mental states such as sadness, which is just false (259-271).

As Levinson points out, instrumental music has not the ability to resemble the physical appearance of an emoting human as does a painting, nor can it communicate emotions verbally as can poetry, literature, theatre, or film. Though I strongly disagree with aestheticians who believe that instrumental music cannot convey actual emotion; in their defense, I would argue that no artwork exists from any Fine or Performing Art discipline that can present any real human emotion. Paintings or sculptures are not real persons, poems are not usually constructed of real speech patterns, and books, plays, or movies, even if based on factual events, are still fictional in a sense as they are not the actual events unfolding in real time.

On the other hand, all arts forms are human constructs and all human beings experience emotions. Can we take our humanity out of the Humanities? We, sentient beings, are the ones who engage in the drawing, painting, reading, writing, composing, and performing. Alperson quotes Hanslick as saying, "Melody and harmony are creations of the human spirit" (254-275). Our perception and cognition, thoughts and feelings, emotions and expressions are all inexplicably immersed in and intertwined with our everyday life experiences. It is impossible to detach our emotions from our actions, and vice versa. Our emotional expressiveness is inseparable in all that we do as human beings, even if we are not so readily aware of its presence at all times (Matravers, 1998).

Is music's imitation of human sounds merely inexact or completely detailed? Regarding style of speech, there are a few fundamental norms in relationship to the rate, volume, and intervals employed by humans when in a certain state of mind or when experiencing a particular emotion. Most would agree that when a person is happy or excited their speech is usually at a faster speed, a louder decibel level, and the intervals or distance between pitches is farther. On the contrary, when a person is sad or depressed their speech is usually at a slower speed, a softer decibel level, and the intervals or distance between pitches is nearer.

Consider a mother talking to her infant in a loving manner. One would probably imagine the woman speaking at a fast pace, in a sing-song voice with pitches spaced apart, louder rather than softer; of which follows the norms stated above for a happy person. Now consider a husband telling his spouse he was fired, one would probably imagine the man speaking at a slow pace, in a monotone voice with pitches close together, softer rather than louder; of which follows the norms for a sad person above stated.

The ideas of speech's rate, volume, and intervallic relationships can easily be transferred over to the musical ideas of tempo, dynamics, and tonal centers. It is in this way that music has the ability to aurally imitate human sounds, in an abstract fashion. Imagine hearing a person wailing in anguish after suffering the loss of a loved one. One might have imagined they were hearing a loud, long drawn out cry; that possibly lowered slightly in pitch when nearing the end. Now if one heard an orchestral cellist reproduce the sound described, could that not be considered an abstract imitation of the human

sound that usually accompanies the emotions of grief and bereavement? On the topic of imagination and musical expressiveness, Trivedi says,

> …when we imagine that someone is crying and expressing their sadness musically, this is in part because we hear the sound of the music resembling human (or some other creature, human-like or not) crying or wailing. And the sound of the music may resemble human crying…due in part to its timbre, pitch, articulation, musical shape or contour, and dynamics…(259-271).

Here is where thoughts of artist intention come into play. Though we have previously focused solely on pure music, consisting of instrumental works without extra-musical themes attributed, it should be noted that many composers do write music with an idea in mind, otherwise known as program music. These ideas are not always so readily apparent to the listener, which is why they often include program notes. At times we may hear a certain emotion in a musical work that the composer did not initially intend to portray when writing the music. This relates to our ability to associate extra-musical ideas to the music itself, by way of making personal connections to a given style, piece, movement, or phrase of music. Alperson would argue that,

> The composer may of course compose under the sway of strong psychological states or with particular worldly events in mind but…such matters are of purely historical and biographical interest. We cannot tell from the work what these causes and conditions might have been, and even if we could, they would be irrelevant to the meaning and value of the work itself (254-275).

Most who study music's aesthetic qualities would suggest that there is no real, concrete evidence to support the claims of musical expressiveness. However, it is important to consider that in areas such as the sciences, when a theory cannot be objectively proved, this does not necessarily make it a falsehood. If a scientist had yet to uncover the mathematical data needed to support a truthful claim, this would not tarnish

or diminish the truth of the matter. Perhaps a theory cannot yet fully be proved because it needs a different way of quantifying. This may very well be the case regarding music's emotional expressions. Although many philosophers do not agree, as Alperson points out,

> It is true, Hanslick concludes, that music may arouse in us intense feelings and moods, as the causal theorists say, but the same may be said of medical reports or our luck in the lottery. We must not be misled into thinking that such feelings have anything to do with the proper understanding of music (254-275).

It is likely that many of today's musicians, performers and composers alike, would agree that they think they hear or feel emotions in or with music. Etienne Gilson agrees, "…music can suggest emotions of a variety, fluidity and delicacy which words are unable to express" (56-68). However, as explained earlier, this is not enough evidence to disprove the contrary. Many aestheticians believe that expressiveness in music is a purely extra-musical idea, experienced by heterogeneous cultures in differing ways and to varying degrees.

Conclusion

While it may be impossible to provide empirical evidence that supports music's ability to express emotion, emotion in music is widely perceived and accepted. Though musicians and aestheticians are still searching for the appropriate language and the adequate proof needed to explain emotional expressions in music; for many, music's affective impact goes unquestioned. "Neuroscientific research indicates that music is processed in the emotional brain (e.g., limbic system, gyrus cinguli, and the paralymbic cortical regions)...Eliciting emotions by music may be a relevant topic and useful tool in the...treatment of...disorders" (Hillecke, Nickel, and Bolay, 276).

A patient's emotions are an integral part of healing, in conjunction with any type of therapy. How our emotional feelings can connect our mental thoughts to our physical health is arguably one of the least understood aspects of today's health-care system. Maybe a better understanding of the affective nature of music, and thus the "emotional factor" of music therapy, could help us to better understand the success of this complex interdisciplinary medical field.

With our current approaches to music therapy research, it is near certain that we may never discover the scientific data needed to prove music's therapeutic properties and medicinal purposes. Perhaps the complex interaction of elements that make up music therapy, need a different way of quantifying. Hillecke, Nickel, and Bolay conclude,

> ...music therapy does not need a new paradigm but may profit from new research methods. In clinical observation the therapeutic use of music

> often seems adequate and beneficial, but the empirical knowledge in our field is rare and limited, yet growing. If we want music therapy to have a more respected and defined role in modern health care systems, enhanced efforts will be needed. Neuroscientific research can help to support the long road toward evidence-based music therapy. We have started to walk this road, but the end is still not in sight (Hillecke, 278).

Possibly future studies of music therapy, as used to treat those suffering from neurological disorders, can help us to better understand its success in the clinical setting. However, to achieve a more holistic understanding of music therapy's effectiveness, we must further comprehend the complexity of its interrelated disciplines, taking into account the important role that emotions play in the healing process.

In the last twenty years, neuroscience researchers in the fields of music perception/cognition have been studying the mental processes involved when a person is listening to and/or performing music (Thaut, vii-viii). Working in an interdisciplinary capacity combining art and science, these exciting new fields have helped researchers to better understand non-musical ideas such as attention, comprehension, and memory. However, the composer Karlheinz Stockhausen states,

> Sonic vibrations do not only penetrate ears and skin. They penetrate the entire body, reaching the soul, the psychic center of perception. The esoteric only involves what cannot be described by means of existing scientific laws and rules. So the next step, time and again, is reinterpretation of the human body as a complicated instrument for perception. That is why every genuine composition makes conscious something of this esoteric realm. This process is endless, and there will be more and more esotericism as knowledge and science become increasingly capable of revealing human beings as perceivers. Neurologists have been seeking for years for the pilot that must obviously exist in the human brain but are unable to find it. They can turn human beings upside down but are unable to discover how the human system is coordinated and centered. That will be discovered step by step, and the profundity of what remains unexplained will also gradually become apparent. I believe that the ratio between the amount concealed, the mysterious, and how much is known

> always remains largely the same. The further your knowledge extends, the more you discover that you cannot explain (Roads, 999: 303).

There is a challenge in understanding the effects of music therapy. We need to better understand how the process works, in order to systematize processes for more effective healing. Perhaps future neuro-scientific studies, using music therapy with brain injury patients, may help physicians to unravel the mysteries of music therapy's effectiveness. Yet, the nature of music therapy is interdisciplinary, as widely so as in any other endeavor. Thorough assessment will require that all those interdisciplinary aspects be taken into account: music, psychology, kinesiology, philosophy, pharmacology, sociology, and biology, among others. The challenge is perhaps related to chaos theory, and we may never be able to achieve a truly objective understanding until we have a mechanism to interrelate all factors. Until that time, perhaps only the realization that music therapy is effective and that we will continue to try to understand why it is, to the extent possible, must suffice.

Bibliography

Alperson, Philip. "The Philosophy of Music: Formalism and Beyond." The Blackwell Guide to Aesthetics Ed. Peter Kivy. New York: Blackwell Publishing Ltd, 2004, 254-275.

Alvin, Juliette. Music Therapy. New York: Basic Books Inc. Publishers, 1975.

American Music Therapy Association. Membership Brochure: AMTA, 1997.

American Music Therapy Association. n.d. <www.musictherapy.org> 2004.

Amoaku, W. Komla. "Toward a Definition of Traditional African Music: A Look at the Ewe of Ghana." More Than Drumming: Essays on African and Afro-Latin American Music and Musicians. Ed. Irene V. Jackson. Connecticut: Greenwood Press, 1985, 31-40.

Austin, Diane. When words sing and music speaks: A qualitative study of in depth music psychotherapy with adults. New York University, 2004.

Barker, V.L., and B. Brunk. "The role of a creative arts group in the treatment of clients with traumatic brain injury." Music Therapy Perspectives 9 (1991): 26-31.

Berger, Dorita S. Music Therapy, Sensory Integration and the Autistic Child. London, Philadelphia: Jessica Kingsley Publishers, 2002.

Blaine, Constance. "Constance Blaine and the Medicine Band: working with brain-injured patients." Open Ear (2000): 191-2.

Bloch, Ernest. Music and Mind: Foundations of Cognitive Musicology. University of California, 1999.

"Brain, The." Diagram. Brainwave Entrainment. Brainwave Mind Voyages. 2008 <http://www.brainwave-entrainment.com/mind-machine/mind-machine.htm>.

Bright, Ruth. Music In Geriatric Care. New York: St. Martins Press Inc, 1972.

British Journal of Music Therapy, The. n.a. <http://www.bsmt.org/journal.htm> 2008.

Burke, Martha A. Effects of music therapy on elderly extended care inpatients receiving radiation or physical therapy. Durham, North Carolina: Center for the Study of Aging and Human Development, Duke University Medical Center; Extended Care and Rehabilitation Center, Durham VA Medical Center, 1995.

Campbell, Don G. Introduction to the Musical Brain, 2nd ed. Saint Louis, MO: MMB Music Inc, 1992.

- - - . Music physician for times to come: an anthology. Wheaton, Illinois: Theosophical Publishing House, 1991.

Center for BioMedical Research in Music. Parkinson's home gait training. Fort Collins, CO: Center for BioMedical Research in Music, Colorado State University, 1994.

Chudler, Eric. Divisions of the Nervous System. 21 March 2008. <http://faculty.washington.edu/chudler/nsdivide.html>.

Cohen, Nicki S. "The Use of Superimposed Rhythm to Decrease the Rate of Speech in a Brain-Damaged Adolescent." Journal of Music Therapy XXV (2) (1988): 85-93.

"Consonance." The American Heritage Dictionary. 4th ed. 2001.

Davies, Stephen. "Artistic Expression and the Hard Case of Pure Music." Aesthetics and the Philosophy of Art. Ed. Matthew Kiernan. Massachusetts: Blackwell Publishing Ltd, 2006, 179-91.

- - - . Musical Works and Performances: A Philosophical Exploration. New York: Oxford University Press, 2001.

- - - . Themes in the Philosophy of Music. New York: Oxford University Press, 2003.

Davis, William B., Kate E. Gfeller, and Michael H. Thaut. An Introduction to Music Therapy: Theory and Practice, 2nd ed. Boston: McGraw-Hill College, 1999.

Davis, Wade. One River: Explorations and Discoveries in the Amazon Rain Forest. New York: Simon & Schuster, 1996.

"Dissonance." The American Heritage Dictionary. 4th ed. 2001.

Eliade, Mircea. "Recent Works on Shamanism, A Review Article." History of Religions 1.1 (Summer 1961): 152-186.

Feibleman, James K. Aesthetics: A Study of the Fine Arts in Theory and Practice. New York: Duell, Sloan and Pearce, 1949. 336-352.

Fidelibus, Joseph F. Mindfulness in music therapy clinical improvisation: When the music flows. New York University, 2004.

Gervin, A. P. "Music therapy compensatory technique utilizing song lyrics during dressing to promote independence in the patient with a brain injury." Music Therapy Perspectives 9 (1991): 87-90.

Gfeller, Kate E. Music therapy for Alzheimer's and dementia individuals. Iowa City, Iowa: School of Music, The University of Iowa, 1995.

Gilson, Etienne. The Arts of the Beautiful. Illinois: Dalkey Archive Press, 2000, 56-68.

"Glasgow Coma Scale." Chart. Beyond the Basics: Trauma Assessment. EMSResponder. Cygnus Interactive. 1 August 2006 <http://publicsafety.com/article/article.jsp?id=3826&siteSection=19>.

Grob, Helen Mandel. "Paraverbal Psychomotor Techniques in Neurologic Habilitation and Rehabilitation." Clinical Applications of Music in Neurologic Rehabilitation. Ed. Concetta M. Tomaino. St. Louis, MO: MMB Music, Inc., 1998, 37-40.

Haneishi, Eri. "Effects of a Music Therapy Voice Protocol on Speech Intelligibility, Vocal Acoustic Measures, and Mood of Individuals with Parkinson's Disease." The Journal of Music Therapy 38.4 (Winter 2001): 273-90.

Hawkins, Heidi M. The Healing Power of Music: The Buddha Listens to the Sound of the Universe, Seattle, WA: Northwest Institute of Acupuncture and Oriental Medicine, 1994.

Hillecke, Thomas, Anne Nickel, and Hans Volker Bolay. "Scientific Perspectives on Music Therapy." Annals of the New York Academy of Sciences 1060 (Dec 2005): 271-282.

"Human Brain, The." Diagram. Brainwave Entrainment. Brainwave Mind Voyages. 2008 <http://www.brainwave-entrainment.com/mind-machine/mind-machine.htm>.

Huron, David. "Is Music an Evolutionary Adaptation?" Annals of the New York Academy of Sciences 930 (June 2001): 43-61.

Hurt, C. P. "Rhythmic auditory stimulation in gait training for patients with traumatic brain injury." Journal of Music Therapy 35 (Winter 1998): 228-41.

Huss, Elizabeth. Interview with Elizabeth Huss, Music Therapist. 13 June 2003. <http://www.performingartsschools.com/guidance/music-therapy/>.

International Society for Complexity, Information, and Design, n.a. http://www.iscid.org /encyclopedia/Lobes_of_the_Brain> 2007.

Jabusch H. C. and Altenmüller E., "Fokale Dystonie bei Musikern: Störungen der feinmotorischen Kontrolle und ihre Behandlung", Das Orchester, 51: 30-37 n3 2003.

Jensen, Eric. Music with the Brain in Mind, San Diego, CA: The Brain Store Inc, 2000.

Kim, Soo Ji, and Iljoo Koh. "The Effects of Music on Pain Perception of Stroke Patients during Upper Extremity Joint Exercises." The Journal of Music Therapy 42.1 (Spring 2005): 81-92.

Knox, Roger. "Musical attention training program and alternating attention in brain injury: an initial report." Music Therapy Perspectives 21.2 (2003): 99-104.

Krout, Robert. "Music Therapy with Multi-Handicapped Students: Individualizing Treatment Within a Group Setting." Journal of Music Therapy XXIV (1) (1987): 2-13.

Lane, Deforia. Music as Medicine, Michigan: Zondervan Publishing House, 1994.

Levinson, Jerrold. Contemplating Art: Essays in Aesthetics. Oxford: Clarendon Press, 2006. 77-220.

- - - . "Musical Expressiveness as Hearability-as-expression." Aesthetics and the Philosophy of Art. Ed. Matthew Kiernan. Massachusetts: Blackwell Publishing Ltd., 2006, 192-205.

Magee, Wendy. "Music Therapy within brain injury rehabilitation: to what extent is our clinical practice influenced by the search for outcomes?" Music Therapy Perspectives 17.1 (1999): 20-26.

Matravers, Derek. Art and Emotion. New York: Oxford University Press, 1998.

- - - . "Musical Expressiveness." Philosophy Compass 2.3 (May 2007): 373-79.

- - - . "The Experience of Emotion in Music." The Journal of Aesthetics and Art Criticism 61.4 (Autumn 2003): 353-63.

McCusker, Elizabeth. Brain Australia: An initiative of the Brain Foundation. 5 June 2003. <http://www.brainfoundation.org.au/az_of_brain_disorders/huntingtons_ disease>.

Merriam, Alan P. The Anthropology of Music. Evanston, IL: Northwestern University Press, 1964.

Meyer, Leonard B. Emotion and Meaning in Music. Illinois: The University of Chicago Press, 1956.

Minson, Ron. "Depression, head trauma, chronic fatigue syndrome and the Tomatis Method." Open Ear (2000): 25-7.

Morris, John. Brain Australia: An initiative of the Brain Foundation. 20 June 2003. <http://www.brainfoundation.org.au/az_of_brain_disorders/parkinsons_disease>.

Morton, L.L., J.R. Kershner, and L.S. Siegel. "The Potential for Therapeutic Applications of Music on Problems Related to Memory and Attention." Journal of Music Therapy XXVII (4) (1990): 195-208.

"Music Physically Considered." The Columbian Magazine 111 (1789): 90-93.

Music Therapy for Parkinson's and Dementia. n.a. <http://www.caregiver.on.ca/cgcihidmmt.html> Caregiver Network Inc. (CNI), Canada, 2008.

Music Therapy A Sound Profession. n.d. <www.mtabc.com> 2005.

National Association for Music Therapy, The. Journal of Music Therapy. Lawrence, Kansas: National Association for Music Therapy, 1969-92.

National Institute of Neurological Disorders and Stroke. 01 May 2007. <http://www.ninds.nih.gov/disorders/brain_basics/know_your_brain.htm>.

Newton, Cam. The Power of Music in Therapy. n.d. <http://www.camnewton.com/music_therapy.htm> 2003.

Nicholls, Robert W. "Music and Dance Guilds in Igede." More Than Drumming: Essays on African and Afro-Latin American Music and Musicians. Ed. Irene V. Jackson. Connecticut: Greenwood Press, 1985. 93.

Nordic Journal of Music Therapy. n.d. <http://www.njmt.no/> 2008.

Nordoff, Paul, and Clive Robbins. Therapy in music for handicapped children London, Gollancz: 1971.

- - - . Creative music therapy: individualized treatment for the handicapped child. New York: John Day Co, 1977.

Prelude Music Therapy, n.d. <http://www.preludemusictherapy.com/> 2008.

"Remarkable Cure of a Fever by Music." New York Weekly Magazine 11 (1796): 44.

Reuer, Barbara Louise. Best practice in music therapy: utilizing group percussion strategies for promoting volunteerism in the well older adult. (manual) San Diego, California: University Center on Aging, San Diego State University Foundation, 1995.

Rhythm Therapy. n.d. <http://www.viewzone.com/rhythm_therapy.html> 2008. Roads, Curtis. "Roundtable II: A Common High-Level Ground for Scientists and Musicians." Annals of the New York Academy of Sciences 999 (Nov 2003): 302-303.

Robinson, Jenefer. Deeper than Reason: Emotion and Its Role in Literature, Music, and Art. Oxford: Clarendon Press, 2005.

- - - . Music and Meaning. New York: Cornell University Press, 1997.

Sacks, Oliver. "Music and the Brain." Clinical Applications of Music in Neurologic Rehabilitation. Ed. Concetta M. Tomaino. St. Louis, MO: MMB Music, Inc., 1998, 1-18.

Schullian, Dorothy M. Music and medicine. New York: H. Schuman Inc, 1948.

Scott, Elizabeth. Stress Management, n.d. <http://stress.about.com/library/weekly/aa052901a.htm> About.com, a part of The New York Times Company, 2005.

Sendry, Alfred, and Mildred Norton. David's Harp: The Story of Music in Biblical Times. New York, NY: The New American Library of World Literature, Inc., 1964.

Sharpe, Robert A. Music and Humanism: An Essay in the Aesthetics of Music. New York: Oxford University Press, 2000.

Shibles, Warren. "Metaphor, Music and Humor." Emotion in Aesthetics. Ed. Keith Lehrer. Massachusetts: Kluwer Academic Publishers, 1995, 146-171.

Small, Christopher. "Musicking - the meanings of performing and listening, A lecture." Music Education Research 1.1 (Mar 1999): 9-22.

Smith, Bonnie Baird. Reclaiming dignity and enhancing abilities through therapeutic stimulation. (project briefs) Logan, Utah: Sunshine Terrace Adult Day Care Center, 1995.

- - - . Reclaiming dignity and enhancing abilities through therapeutic stimulation. (final report) Logan, Utah: Sunshine Terrace Adult Day Care Center, 1995.

- - - . A song to set me free. Logan, Utah: Sunshine Terrace Adult Day Care Center, 1995.

Smith, Ronald R. "They Sing with the Voice of the Drum: Afro-Panamanian Musical Traditions." More Than Drumming: Essays on African and Afro-Latin American Music and Musicians. Ed. Irene V. Jackson. Connecticut: Greenwood Press, 1985, 163-198.

Stanford, E. Percil. Best practice in music therapy: utilizing group percussion strategies for promoting volunteerism in the well older adult. (final report) San Diego, California: University Center on Aging, San Diego State University Foundation, 1995.

Swiercinsky, Dennis. Brain Source. 11 July 2001. <http://www.brainsource.com/brain%20injury.htm>.

Thaut, Michael H. Rhythm, Music, and the Brain: Scientific Foundations and Clinical Applications. New York: Routledge, 2005.

Thaut, Michael H., David A. Peterson, and Gerald C. McIntosh. "Temporal Entrainment of Cognitive Functions." Annals of the New York Academy of Sciences 1060 (Dec 2005): 243-254.

Trivedi, Saam. "The funerary sadness of Mahler's music." Imagination, Philosophy, and the Arts. Ed. Matthew Kiernan and Dominic Mclver Lopes. London: Routledge, 2003. 259-271.

University of East Anglia. Computer Supported Cooperative Learning, Jean Piaget, n.d. <http://www.uea.ac.uk/menu/acad_depts/edu/learn/morphett/piaget.htm> 2008.

Vanderbilt Kennedy Center for Research on Human Development. n.a. <http://kc.vanderbilt.edu/kennedy/research/topics/plasticity.html> 2008.

Voices, A World Forum For Music Therapy. n.a. <http://www.voices.no/> 2001.

Wade, Bonnie C. Thinking Musically: Experiencing Music, Expressing Culture. New York: Oxford University Press, 2004.

Wallace, Robert W. "Damon of Oa: A Music Theorist Ostracized?" Music and the Muses: The Culture of 'Mousikē' in the Classical Athenian City. Ed. Penelope Murray and Peter Wilson. New York: Oxford UP, 2004, 249-267.

Weinberger, Norman M. “Music and the Brain.” Scientific American 25 Oct. 2004: 88-95.

Wheeler, B. L. “Effects of number of sessions and group or individual music therapy on the mood and behavior of people who have had strokes or traumatic brain injuries.” Nordic Journal of Music Therapy 12.2 (2003): 139-51.

Winkelman, Michael James. "Shamans and Other "Magico-Religious" Healers: A Cross-Cultural Study of Their Origins, Nature, and Social Transformations." Ethos 18.3 (Sept 1990): 308-352.

Winnington-Ingram, R. P. Mode In Ancient Greek Music. London: Cambridge UP, 1968.

Zangwill, Nick. “Against Emotion: Hanslick was Right about Music.” British Journal of Aesthetics 44.1 (Jan 2004): 29-43.

Ziv, Naomi, Amit Granot, Sharon Hai, Ayelet Dassa, and Iris Haimov. “The Effect of Background Stimulative Music on Behavior in Alzheimer's Patients.” The Journal of Music Therapy 44.4 (Winter 2007): 329-43.