Music as Medicine: The Healing Quality of Music through a Historical, Cultural, and Modern Lens

by

Dominic M. Bechtel

Presented in partial fulfillment of the requirements

for

Departmental Honors

in the

Department of Music and Performing Arts

(Music)

and

Department of Psychology and Counseling

(Psychology)

Hood College

Dominic M. Bechtel

Dr. Verzosa

Departmental Honors

25 April 2025

Introduction

Attempting to create an equilibrium between music and medicine is an art as ancient as the two disciplines themselves. The concept of music as a source of healing has been provocative to a plethora of authorities in diverse academic fields. Plato, often regarded as the founding father of western philosophy, stated "[R]hythm and harmony find their way into the inward places of the soul." (Plato 86) Plato was using poetic language to refer to music's inherent ability to ease the symptoms that one cannot see. Even during humanity's earliest and most antiquated periods, it was evident that a visionless medium of art could possess an extraordinary quality for healing.

Haruki Murakami, a prolific Japanese writer and thinker of the 20th century, once wrote, "[M]usic brings a warm glow to my vision, thawing mind and muscle from their endless wintering." (Murakami 271) In the forementioned quote, Murakami refers to music's ability to heal both physical and mental aliments. The interesting diction in describing painful symptoms such as cold temperatures can be interpreted as music bringing a warmth into his life. Music manifesting as a welcoming warmth physically and mentally is the overwhelming conclusion of two thinkers from different continents, eras, and time periods.

When applying an anthropological perspective to the conclusion of the two totally distinct thinkers, the evidence is clear across cultures. Music has an inherent ability to heal the physical

and mental. Cultures from the dawn of human existence to the modern era have all used music as a form of medicine. Medicine as a discipline, while relating more to the natural sciences rather than art, has roots in musical concepts. Music espouses what is fundamental to human prosperity; human prosperity is the basis of medical principles. The marriage between the two disciplines is not simply fortuitous, it is essential. This paper will make the argument that music can be equally as effective in healing outcomes as vaccines, nutritional interventions, and pharmacological treatments. The evidence for the forementioned claim is the healing practices of the ancient Greeks, Native American Indigenous tribes, and the ancient Egyptians.

ANCIENT GREECE

Ancient Greece is known for immense advancements and developments in areas such as mathematics and architecture; it is of no surprise that they were quick to discover the healing properties of music. In fact, music and healing were so intertwined that the Greek god, Apollo, was both the god of music and healing. Apollo is often depicted as a young, virtuosic, and athletic deity who often bears a lyre, a harp-like string instrument (Cartwright, 2012). Apollo himself embodied health for the entire culture. The physical health of Apollo buttressed with his dual status as deity of healing and music emphasizes how ingrained the concepts of music and medicine were in the culture. Both music and medicine were based upon the concept of balance, a fundamental necessity for human prosperity. In fact, Aristotle's book *Politics* showed how music can be used for tranquility and relaxation (Aristotle, 186). For all the technical advances in ancient Greek culture, they were quick to discover that music can provide a relaxing quality.

All of ancient Greek medicine was based on four distinct humors: blood, yellow bile, black bile, and phlegm. To be considered healthy: yellow bile was meant to be hot and dry, phlegm was

meant to be cold and moist, blood was meant to be hot and moist, and black bile was meant to be cold and dry. If all four humors were in balance and all fluids were at the correct temperature as previously described, one was considered healthy (Tuohy, National Institute of Health). If one humor was unbalanced, the patient was considered sick. Music was used to help create a balance between the four humors and bring patients to a healthy state.

The two main instruments used in ancient Greek music therapy was the lyre and the aulos, a double reed piped recorder instrument (Encyclopedia Britannica). Plato described the lyre as having a quality that stimulated the soul and the aulos as quieter for an intimate healing. The instruments were used together, separately, or at various times across differing procedures. Specifically, both the instruments were used simultaneously to treat gout, a type of swelling in joints. The ancient Greek physician Asclepiades of Bythnia used music therapy and its typical instruments to pull patients out of melancholic states. These historical facts highlight how music was used to treat the physical and mental symptoms of a patient in ancient Greece (Hsu, University of Florida). The pioneer of music therapy in the classical world was the philosopher Pythagoras.

Pythagoras was fascinated by the concept of balance in life. The philosopher used math as a tool to describe how the world is balanced. His theory of the world in terms of balance included: arithmetic being numbers in themselves, geometry being numbers in space, music being numbers in time, and astronomy being numbers in space and time. Pythagoras believed that numbers in time had a special connection to physical healing. Different musical intervals were used to make harmonies that healed the human body, each harmony healed a specific aliment or condition (Ferguson, *The Music of Pythagoras*). The music was also used to heal mental ailments as well.

Pythagoras created a treatment for the mental and spiritual diseases he called soul adjustments. By creating a correct musical interval that is harmonically pleasing to the ear, the

patient began to feel better. This treatment by musical intervals started a concept that Pythagoras called Harmonia, a divine principle that brings order to chaos. To the people of ancient Greece, music was equally as important as disciplines such as mathematics and biology. The entire culture believed that music was a tool that could be used to understand all aspects of nature. Pythagoras's view of music as medicine highlights how music was as essential to the prognosis of a disease as scientific discovery. Having musical harmony brings calm and order to chaos emphasizes how music was respected. Pythagoras involved all elements of music in his ideas of medical interventions. For example, rhythm was also considered an essential element to medical interventions. Rhythm was found especially helpful for physical ailments that involved balance. Out of all the elements of music, rhythm is the most basic to human experience. Even the most musical novice utilizes rhythm in routine life.

Musical rhythm in ancient Greece was derived from the meters of poetry. The rhythms were based solely on the duration of syllables of words and whether they create patterns of long and short sounds. After deriving from poetry, rhythm became combined with meter, melody, and harmony as they became invented (Angour, *Ancient Greek Music*). The musical element of rhythm was so essential to human nature it was outlined in their speech. A historical example of early Greek speech rhythm is best understood in the Greek tragedy *Orestes*. The tragedy was written by the Greek dramatist Euripides in 408 BC. The tragedy tells the story of the aftermath of Orestes' matricide (Encyclopedia Britannica, Orestes). The specific example of speech rhythm comes from the chorus.



(Euripides)

The ancient manuscript above are the lines 338--344 from the first chorus of Orestes. The words translate to, “I cry, I cry, your mother’s blood that drives you mad, great happiness in mortals never lasting, but like a sail of a swift ship, which a god shook up and plunged it with terrible troubles into the greedy and deadly waves of sea” (Euripides, lines 338-344). The manuscript outlines speech rhythm because of the symbols written above the Greek lettering. The symbols refer to how the chorus should be performing the text. For example, the word cry, sometimes translated as lament, has a symbol instructing the performer to sing a downward musical interval. Although this historical fragment does not manifest itself as a direct link between rhythm and healing, it shows a deep truth about ancient Greece; rhythm is directly engrained into their society, culture, and art.

Over the history of ancient Greek musical medicine, harmony and rhythm were combined to make the most favorable outcomes (Hsu, University of Florida). One may begin to think that

ancient Greek musical therapy techniques are an archaic medical technique from the classical period, this could not be further from the truth. Concepts of ancient Greek musical medicine have a direct impact in modern medicine; the concepts of Pythagoras and Asclepiades are not merely vestigial structures in the evolution of musical medicine.

Modern medical practices use Pythagoras's concept of Harmonia and rhythm to achieve positive medical outcomes. Modern music therapists have created a technique called rhythmic auditory stimulation (RAS); this involves showing a patient auditory rhythmic cues in the form of repetitive isochronous pulses. Once a patient has become comfortable with the pulse relative to beats per minute, it can be slowed or hurried five to ten percent above or below baseline (Janzen, 2022). There are two observations to be made from the modern technique of RAS. Firstly, the concept of rhythm healing physical ailments is a direct link to ancient Greece medical practices that are still used in the modern era. Secondly, both ancient Greek and modern culture understood that musical rhythm is an essential part of humanity's healing, and existence. In fact, the ancient Greek physician Galen is coined for becoming the first to discover the circulatory system (Blood Pressure History, 2018). There is an argument to be made that the entire circulatory system is based upon a common rhythm. In the modern era, blood pressure is measured by two distinct numbers. The first is systolic blood pressure, indicating how much blood pressure is pushing against artery walls when the heart beats. The second is diastolic blood pressure, indicating how much pressure is pushing against your artery walls while the heart is resting between beats (Mayo Clinic Staff, 2021). The concept of the circulatory system being measured by beats is a testament to ancient understanding and appreciation of music. One could argue that the human body is based upon musical beats and not a result of an ancient understanding that music is an essential part of human existence. A medical professional utilizing music would agree and state that music is so interwoven

into humanity, it is obvious to even science itself. Even in less advanced societies than today, music has always been a building block to culture, society, and even our anatomy. Societies around the world have understood music as an institution.

The ancient Greek invention of musical modes showcases music as an institution. Musical modes are scale-like patterns based upon a root note that are known to invoke certain emotions in the listener. Each mode is named after geographic or ethnic regions in ancient Greece. All musical scales comprise a set order of intervals known as whole steps (W) and half steps (H). The order of the intervals determines the quality of the scale (e.g. bright, dark).



Ionian Scale

The figure above shows a combination of musical intervals. The specific mode highlighted above is the Ionian scale. Modern times This mode is known for its bright quality and joyful nature.



Aeolian Scale

The aeolian scale is known for its dark and mysterious character. Important to note, the key characteristic of the scale is the third half step.



Dorian Scale

The Dorian scale is known for its raised sixth scale degree when compared to the Ionian scale. The raised sixth gives the scale a whimsical and fanciful quality.

The value of emotional quality showcases how the ancient Greek musical modes are embedded in their emotional qualities. Ancient Greek physicians would compose songs and compositions in various modes to invoke healing depending on what remedy was appropriate. For example, if one was sad, a song written in the Ionian mode was utilized (Jones, 8).

An example of ancient Greek healing through musical modes can be found in the album *íasis*, from the artist, Seikilo Ancient World Music. The album contains a performance of ancient Greek healing songs on the lyre. The album contains a piece entitled, Aegle. Aegle directly translates to brightness or good health. The piece is written in the aeolian mode and shows a lyre in monophonic texture performing a melancholy melody. The title of the piece displays a dichotomy between the healing intended and the musical mode; the piece is written in aeolian mode and has a title meaning bright. The piece is named after the Greek goddess Aegle, the daughter of Asclepius the god of medicine. Aegle is mythicized to embody good health in the form of a radiant healing glow of light. The piece is meant to show how even in our darkest hour, brightness can be found. When the piece is performed for the sick individual, Aegle's radiant healing is said to bring radical physical improvement (Atsma, Theoi Project). The dichotomy in the piece shows how integral music was to medical healing in ancient Greece. The mythical allusion to the goddess Aegle in the title shows how widespread the combination of music and medicine was in ancient Greek society. The average Greek would simply assume that medicine involved some form of music.

Another piece on that album utilizes the Dorian mode in healing. The title of the piece is Íasis, one of the Ionides nymphs whose spring waters were known to cure diseases. The Ionides nymph were a sisterhood of water female deities (Atsma). This piece utilizes the lyre in a much different way when juxtaposed with the previous piece. The lyre is performing a far more uplifting

melody. The song mainly portrays a monophonic texture with occasional moments interrupted by another string. The piece utilizes the Dorian mode's whimsical nature to heal the patient directly, unlike the last piece's mythical allusion. Both examples of musical modes show healing in different contexts. To ancient Greeks, the concept of musical modes was inherent. An average citizen may not be formally educated in music theory, but they feel the various effects of healing.

It is not a mere coincidence that great thinkers such as Aristotle and Plato believed in music as a scientific discipline for healing. A listener accustomed to western music would hear the piece as simply melancholy, antiquity saw potential for medical discovery. One could argue that understanding ancient medical practices does not have application in the modern era. A counterargument would suggest that learning ancient musical medical practices encourages a clinician's cultural proficiency, facilitates new innovations by shining light on those of the past, and may provide alternative treatment. Musical medicine is alternative medicine at its core. Music as medicine in the modern era often must justify its mere existence. As discussed earlier, antiquity believed music was synonymous with medicine. Musical medicine has been with humanity since the concept of developing healing as a discipline. Making an argument that musical medicine is futile would-be denying history as truth itself.

The ancient Greeks used music as a form of scientific communication; other cultures used music as communication through a different lens, such as an artistic standpoint.

NATIVE AMERICAN INDIGENOUS TRIBES

To best understand the healing power of Native American music, it is important to understand Native American culture itself. It is nearly impossible to create a complete and astute comprehension for Native American culture; one reason being is that the overall culture is

generalizing many tribes all with differing values, art, and languages. If one were to attempt to manufacture an answer, it would be that it is often contradictory to modern western culture. For example, more emphasis is placed on old age rather than young people. The older one is in Native American culture; they are seen as possessing wise characteristics and earn great respect. In Native American cultures, more emphasis is placed upon working simply for the family unit. If one has enough money to provide for the family, it is considered a good life. In western cultures, more emphasis is placed upon working for the sake of financial wealth. In Native American culture, being in harmony with nature is of utmost importance. In western cultures, having mastery over nature is the ideal. (Dunbar-Ortiz, *An Indigenous Peoples' History of the United States*). When examining the relationship between music and medicine in Native American culture; being in harmony with nature was merely synonymous with being considered healthy. For the purposes of this paper, music as medicine will be explored through two distinct tribes: Navajo and Sioux tribes during the 17th and 18th centuries.

The Navajo tribe is one of North America's most well-known and celebrated tribes. The tribe refers to themselves as the *Diné*, which directly translates to "the people." The Navajo have historically resided in what is now present-day New Mexico. They speak a language which is accepted to be from Canada and Alaska. The Navajo were natural hunter-gatherers and ate mostly game animals. Their food consisted of primarily beans, corn, and squash. Their religious life was based on mythical creation stories that described the universe as ordered, harmonious, and beautiful. Ceremonies were a distinct part of Navajo religious gatherings. A ceremony was used to celebrate the universe's harmony or to seek healing. An important part of a Navajo religious healing service was the music (Navajo, Cultural Survival).

Music was essential to the Navajo way of life, not only for healing but for all aspects of life. Social gatherings, weddings, funerals, and even graduations. One might be surprised at how dynamic and musical a tribe leader's voice can become. With a small framework of monophonic texture, meaning only one voice singing a melody unaccompanied, a Navajo singer can display all aspects of human emotion through their voice (Rhodes, Introduction to North American Indian Music).

The most famous of all Navajo music are the healing chants. Navajo healing chants are based on curing and can be performed according to three rituals: holy way, evil way, and the life way. The holy way chants are sung to those who are directly in need of medical healing. The philosophy behind the holy way chants propose that the music being sung will attract healing. The evil way chants act to exorcise evil over the one being sung over. The life way chants are used specifically to treat physical injuries caused by accidents. It is important to note that all Navajo chants come from the blessingway. The blessingway is the central ceremony of a complex system of Navajo healing chants. While the blessingway is not intended for physical healing itself, it is known to actualize the healing process. Blessingways are only intended to last two nights and be a part of a larger healing ceremony (Rhodes).

Much of Navajo life was balanced around an idea known as Hózhó, a wellness philosophy and belief system. The word itself encompasses beauty, harmony, and order. The philosophy contradicts modern western civilization. The Navajo use Hózhó to find beauty within themselves rather than resorting to physical worldly endeavors (Koithan). The concept of Hózhó encompassed how the Navajo treated relationships, spirituality, family, and health. Balance is considered vital to health in Navajo medicine.



(Arizona State University)

The tapestry above shows Navajo culture and philosophy through the lens of visual art. Each individual tapestry can represent a tribe's history, spirituality, and connection to the land. Often, different colors on the tapestry showcase various aspects of Navajo culture. For example, red can symbolize energy and victory. The shapes on the tapestry represent physical surroundings such as land, horizons, or water features (Arizona State University). The tapestry is a physical representation of the concept of Hózhó; every tapestry is orderly, beautiful, and harmonious. Visual art, much like music, represents how a culture thinks, acts, and its value system. The Navajo civilization placed a large emphasis on emotional and physical healing through art.

Unlike the Greek philosophers that attempted to understand musical medicine through science, Navajo believers believed that music was emotional communication. Instead of relying on mathematical principles like Pythagoras, the Navajo used spirituality as the language The

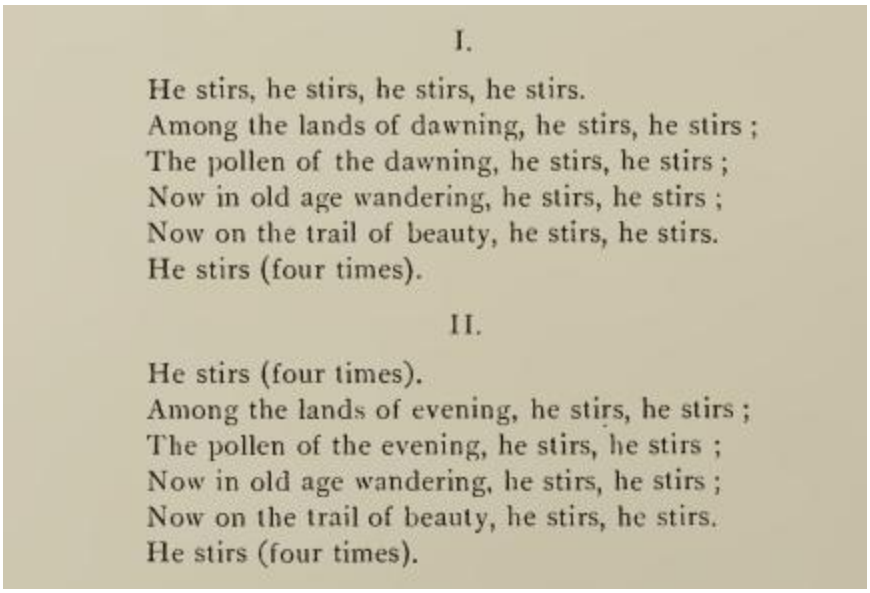
Navajo believe that music could connect to nature, deities, and tribe members who have died. A major theme of Navajo healing chants is balance. A common belief was that illness occurred because of an imbalance in the body with a spiritual force. The process of chanting is thought to channel spiritual communication directly into the sick individual. Another element of the chanting was repetition. The Navajo believed that repeating a chant continually will deepen spiritual communication. Many cultures and religions use this same technique in the 21st century. For example, Roman Catholics will pray the same words in repetition while doing a Marian devotion to achieve a meditative state (Mitchell, Chapter 1). The belief that Navajo healing chants and services were primitive is an argument of academic ignorance.

In *Revisiting the Navajo way: Lessons for contemporary healing*, an article by Dr. Schneider and Dr. Dehaven, a refutation of the belief that Navajo chants are primitive is introduced. The authors believe Navajo healing ceremonies utilize the biopsychosocial model of health and illness created by psychiatrist Dr. George Engel in 1977. The model was created as a juxtaposition to the biomedical model, an institution of modern medicine. The biomedical model is a simple framework used to understand, diagnose, and treat diseases. The model simply considers purely physical factors, and their etymology. The model fails to incorporate emotional and social factors when healing a disease. The biopsychosocial model of health by Dr. Engel proposed that disease occurs from a combination and interaction of different factors like biological, social, and psychological.

When performing a Navajo healing chant, the culture was unknowingly utilizing Dr. Engel's biopsychosocial model of health. The chants would heal patients with diseases caused by imbalance. The liberal view of what imbalance manifests as showcases the genius innovation of Navajo healing chants. Based upon the imbalance occurring, the Navajo would use the

blessingway, the holy way, or the life way to heal the patient. The concept of Navajo chants being primitive is an idea that is rooted in ignorance. If modern medicine had employed the biopsychosocial model foundations from the Navajo, perhaps a figure like Flornce Nightingale would have revolutionized medical hygiene sooner. While the previous argument could be perceived as pontificating, true knowledge comes from combining innovations from various disciplines. Espousing a broad perspective of how medicine manifests and functions can help create a more robust medical landscape. The better a medical practice is, the more lives are saved and improved. Perhaps the difference in saving lives could be from a difference in perspective. Dr. Dr. Schneider and Dr. Dehaven articulate the previous argument, "[A]lthough physicians may have the means to restore physical integrity, they seem to lack the ability to address the patient's illness *as experienced by the patient*. Traditional healers, who often help patients make sense of their illness in the context of their day-to-day lives, may offer lessons for contemporary physicians." (Schneider & DeHaven, pg. 414). Juxtaposing different disciplines offers true knowledge to modern health professionals. The physicians of today must be knowledgeable of psychology, sociology, art, philosophy, culture, etc. Human diseases manifest as uniquely as humans themselves are unique.

Although the melodies of Navajo chants were never written down, a man named Washington Matthews, a linguist and ethnologist, observed a nine-day traditional healing ceremony in 1902. The ethnologist documented the experience in a book simply entitled, *The Night Chant*. The book provides a detailed account of the entire ceremony, including the texts of the musical chants.



I.

He stirs, he stirs, he stirs, he stirs.
Among the lands of dawning, he stirs, he stirs ;
The pollen of the dawning, he stirs, he stirs ;
Now in old age wandering, he stirs, he stirs ;
Now on the trail of beauty, he stirs, he stirs.
He stirs (four times).

II.

He stirs (four times).
Among the lands of evening, he stirs, he stirs ;
The pollen of the evening, he stirs, he stirs ;
Now in old age wandering, he stirs, he stirs ;
Now on the trail of beauty, he stirs, he stirs.
He stirs (four times).

(Matthews, pg. 110)

The excerpt above is from Matthews's book retelling the waking song for the patient from the fourth day. The text employes many of the typical mechanics of a Navajo chant. For example, there is repetition. As stated previously, repetition is used for creating a deeper environment for spirituality and meditation. In the above chant, "he stirs" is listed thirty-two times. The repetition in this particular chant is used to reach the power of various gods, one for each verse, to promote healing for the individual. The chant displays the biopsychosocial model of health by appealing to various aliments through the different gods. The chant also utilizes the concept of Hózhó by healing the patient through various gods relating to the earth. "Stirring" in the above text refers to waking through healing power rather than physical stirring. The concept is that each god will awaken and provide guidance and balance. While each stanza is performed, a mask representing each subsequent Navajo god is held by the shaman. The shaman shakes the mask of the god mentioned in the stanza sung and places it back down after it is finished. Each line in the chant

follows the same rhythmic structure, typical of Navajo music. Important to note, the Navajo language is a tonal language.

A tonal language is one in which the pitch or tone used when speaking a word changes its meaning. A language that relies on pitch for meaning could be argued to be a justification for music's inherentness in humanity's anatomy and psychology. Humans understand the concept of pitch in such a manner that it is used to describe existence itself.

The Sioux tribes can be found in modern day North Dakota, South Dakota, Montana, Minnesota, and southern Canada. Sioux are also called the Oceti Sakowin. Important to note, Sioux is an exonym given to the peoples by outsiders. Oceti Sakowin translates to seven council fires. The fires symbolize the seven original bands that make up the Sioux. The original bands were the Mdewkanton, Wahpeton, Wahpekute, Sisseton, Yankton, Yanktonai, and Teton. The tribe are a nomadic people and are often centered around buffalo. The Sioux are divided into three subgroups from the original bands. Each subgroup is divided based on a common language: the Dakota, the Nakota, and the Lakota. The Sioux family structure was of utmost importance; the women were managing household chores as men were hunters. Unlike the Navajo, Sioux religion was monotheistic and relied around a central creator called the Wakan Tanka, directly translates to "great spirit." Before contact with European peoples, the Sioux gathered wild rice and ate meats such as deer and buffalo. The buffalo played a central part in Sioux rituals (Encyclopedia Britannica, Oceti Sakowin). Much like the Navajo, the Sioux believed that healing relied on balance. The Sioux did have a broader scope of practice for medical practices. The people employed herbal medicine, musical medicine, and spiritual medicine when healing patients. There are important similarities with medicine of both the Navajo and Sioux. For example, the Sioux and Navajo utilized music during rituals, both used a central religious figure to perform the healing

ceremony, and both showed the importance of rhythm when communicating with the spiritual world. Also important to note, the term medicine implies a much different meaning to a native American than in modern western culture. Medicine implies a vast array of ideas and concepts. The Sioux peoples would refer to many objects as medicine. For example, whisky was called medicine water. As A. Beliz Tascioglu articulately states in the journal *Turkish Neurosurgery*,

> "[O]ne of the main differences between Western and Native American medicine is that most Indian concepts of health and daily living are centered on wellness, not illness. In fact, the emphasis of most Indian practices was to prevent illness and misfortune. Preventive medicine is a very prominent aspect of medicine in the modern societies of today's world. In many Indian communities, healers were sought in times of illness, but they were also called upon for protection, to bless happy occasions (weddings, the birth of a child, and others), or to ensure the success of an expedition or hunt" (Tascioglu, pg. 2).

The previously mentioned quote alludes to the concept of balance. The native American Indigenous tribes treated balance in terms of health, not illness. Just as much emphasis was placed on misfortune as biological factors. The idea of medical professionals aiding in protection is an ancient idea. There are profound lessons to be learnt for medical professionals in the idea of protection. If modern era professionals thought of patients on a more holistic level, perhaps more healing could occur. If clinicians were with the patient to celebrate joyful moments, aid in times of grief, or help with personal problems, medicine would thrive with better outcomes. Apart from the reason medicine is mystified is because of professionality; most medical professionals are seen as cynical scientists who spent many years at university. If this chasm between medicine and society is healed, patients would feel more confident in medical professionals. Music can help heal the previously mentioned chasm. Tascioglu articulated why native American medicine should not

be seen as primitive. A modern era medicine man should have the ability to connect with patients on a personal level. An argument is to be made that Sioux medical practices may have lessons for modern professionals. The one aspect of medicine that the Sioux peoples did well was patient relationships; this connection occurred through means such as art, personal relationship, and empathy.

A 2021 study through the East China Normal University examined the physician-patient relationship, physician empathy, and patient trust. The participants came from one hundred-three different hospitals in the eastern developed regions, central sub-developed regions, and western underdeveloped regions of China. The main measuring system they used was the Chinese version of Consultation and Relational Empathy Scale, Wake Forest Physician Trust Scale, and the Patient Doctor Relationship Questionnaire. The Consultation and Relational Empathy Scale (CARE) is a person-centered process measure that only involves ten questions. The Wake Forest Physician Trust Scale (WFPTS) is also a person-centered process measure that only involves ten questions. The questions on the WFPTS are blunter and more provocative than the CARE. The questions on the WFPTS include, “Sometimes [your doctor] cares more about what is convenient for [him or her] than about your medical needs,” and “Sometimes [your doctor] does not pay full attention to what you are trying to tell [him or her]” (Wake Forest Trust Scale). The hospitals came from primary, secondary, and tertiary hospitals. A primary hospital is the first level of healthcare including physicians, nurse practitioners, pediatricians and doctors. A secondary hospital consists of specialists such as cardiologists, oncologists, and endocrinologists. A tertiary hospital includes a higher level of care within a specialization, usually taking several overnight days. Examples of procedures in tertiary hospitals include organ transplants, trauma surgery, and dialysis. The requirements to participate were that the participants must be eighteen years old and speak

Mandarin. All study data was collected anonymously and kept confidential. Patients' mean age was 43.2 years old.

Table 1 Demographic Characteristics of Patients (n=2256)

Demographic variables	n	(%)
Gender		
Male	963	42.7
Age		
18–30	606	26.9
31–40	495	21.9
41–50	469	20.8
51–60	384	17.0
> 60	302	13.4
Education		
Primary school or below	253	11.2
Junior high school	534	23.7
Senior high school/technical school	506	22.4
Junior college	430	19.1
Undergraduate or above	533	23.7
Hospital grade		
Tertiary hospital	1778	78.8
Secondary hospital	274	7.7
Primary care institution	204	2.9
Region		
Eastern	683	30.3
Central	761	33.7
Western	812	36.0

(Wu et al., pg. 1390)

The results show that empathy had a strong correlation between patient's ratings of the quality of their relationship with their physician. Empathy had a greater impact on patient rating than overall trust or trust in the physician's benevolence. Physician benevolence was never a concern in Sioux culture because of the inherent respect between physician and patient. The medicine man or women was an institution in the tribe. The main conclusion of the article was that a patient is more likely to trust their physician on the grounds of benevolence, rather than competence. This proves that in the modern era, a patient's perceived empathy in the physician matters greatly across demographic variables. The Sioux never had an issue with discerning a medical professional's intentions. Since the medicine man or woman was so connected in the tribe, it was easy to trust them. Their healing services were numerous nights in duration, the patient never felt that they were rushed or just another patient. The medicine man had an immediate connection to spirituality, art, and culture. By no means is this an argument that modern physicians should reference religious figures or prayers during treatments; this is merely a suggestion that

physicians should make a greater attempt at learning various cultures and their art when practicing medicine. Perhaps employing Sioux medical practices can show modern professionals how to increase patient empathy, thus leading to better medical outcomes. A useful tool to increase patient-physician trust is also being knowledgeable about culture, art, and history. Perhaps the greatest form of art to combine with medicine is music. Music as a discipline employs philosophy, history, culture, art, and sound. With an artform as wide ranging as music, it is only obvious that medicine has its stake in it.

An ethnomusicologist named Frances Densmore portrayed Sioux music and culture in a book entitled, *Teton Sioux Music and Culture*. The book explores the role of music in Sioux culture including mundane life, medicine, warfare, and festivals. Densmore devoted her entire ethnomusicology career to transcribe the traditional music of American Indian peoples. The music transcribed was recorded from 1911 to 1914. The recordings were made on a phonograph cylinder. Page two hundred sixty-eight of *Teton Sioux Music and Culture* showcases a peerless example of Densmore's ethnomusicology pursuits.



(Densmore, pg. 268)

Transcribing a Sioux healing song is an unmatched feat of ethnomusicology. To begin to understand the historical significance of the above figure, a musical analysis and translation are required. The piece is written in the key of D minor. In western classical music, a key is scale of pitches that gives a piece of music its character, temperament, mood, and quality. The concept of keys is very similar in concept to musical modes, as discussed earlier. The time signature that Densmore suggested is 2/4; this implies that there are two beats in a measure and a quarter note counts as one beat. Important to note, the Sioux music leader did not intend for the song to be composed in a time signature. The signature is merely an analytical interpretation of Densmore's rather than historical veracity. The signature does change throughout the song, fluctuating from two beats in a measure to three. The piece is monophonic with only one voice recorded. A drum was used but did not provide harmonic accompaniment. One may observe the curved lines over some of the notes. The curved lines are called slurs, markings used to indicate that notes should be sung without rearticulating them. To perform a slur, a singer must smoothly sing the pitches of the notes together without creating a perceptible break. Densmore also recorded fermatas, a musical symbol that indicates a chord or note is held for longer than its normal duration. A fermata's length is at the performer's discretion.

The healing song stays within a comfortable singing range within an interval of an octave. As discussed earlier with the concept of modes, an interval is the distance between two pitches. Often, one would describe a melody as being either conjunct or disjunct. A conjunct melody contains stepwise features and is often regarded as smooth. A disjunct melody often has much larger jumps of whole steps and half steps between notes. The healing song's melody is unique in that it contains elements of both. For example, the fourth measure can be seen as conjunct. Sometimes, the melody stays on the same note for an extended period; this is called prime notes.

An example of prime notes can be found in the third measure. Other times, the melody jumps between notes in a disjunct fashion, like the ninth measure.

The tempo of the song is marked by the musical quarter note equaling sixty-six. The tempo of a song or piece is recorded in beats per minute (bpm). The more beats per minute a tempo marking indicates, the faster the song. In this particular song, there are sixty-six quarter notes in a one-minute duration of time. In western classical music, certain tempos are associated with Italian terms. For example, a rather fast tempo of one hundred fifteen quarter notes within a one-minute duration would be sanctioned as *allegro*, meaning quickly. The Sioux healing song would indicate an *adagio* marking, meaning slowly. The healing song showcases three distinct rhythms. The first rhythm is consistent with a sixteenth note followed by a dotted eighth note. A dot next to a note implies that the note value's length should be increased by half of its original length. For example, a dotted quarter note would have a note value of one and a half beats. The quarter note has an inherent value of one quarter note, while the dot adds another eighth note. The last two notes in the song's first rhythm are two eighth notes.

The song's second rhythm contains a distinct new musical idea. The new rhythm begins on the third beat of the sixth measure of the piece. The note value of the new rhythm begins as an eighth note, which is followed by two sixteenth notes. Next, a dotted eighth note followed by a sixteenth note is utilized. Succeeding the sixteenth note is an eighth note followed by two more sixteenth notes. Finally, two eight notes are used to finalize the song's second rhythm. Important to note, the last eighth note contains a fermata. The song's third rhythm begins with two eighth notes followed by a sixteenth note and a dotted eighth note. Subsequently, a half note is introduced, this is the longest note value in the entire song. After the half note is a quarter note. Thereafter,

there is a sixteenth note followed by a dotted eighth, an eighth note, two sixteenth notes, and two half notes.

One may question the necessity of outlining the entire rhythm of a song, especially from a historical ethnomusicological perspective. The value of outlining a rhythm is imperative to understanding its historical significance because, much like the ancient Greeks and Navajo cultures, rhythm played an important role in the healing process. The rhythm in the above figure mimicked religious speech, which is said to be thought of as a deity speaking directly to the patient. While western European music traditions favored portraying the Christian god, the native American indigenous tribes portrayed Wakan Tanka. In many ways, the Sioux are a model example of the blending between the western Christian church and the polytheistic Navajo. When juxtaposing the Sioux, Navajo, and Christian religious traditions, it becomes obvious that they have drastically different approaches to understanding the universe. What is not considered obvious is that the Sioux contains the same element of the Christian church being monotheistic, while using the artistic style of the polytheistic Navajo culture. The Sioux healing songs show how art can be an insight into how other cultures express ideas. Studying the rhythm of the healing songs is not merely choosing between frivolous notes, it is studying how to express complex ideas of the universe. The rhythms of the healing song can provide a pathway toward spiritual awakening to the Wakan Tanka. Rhythm helps to bring more emphasis and thought to the words, which in turn can aid in spiritual healing. Since the Wakan Tanka espouses the concepts of peace and harmony, rhythm can provide consistency which can help lead the patient to peace and harmony. Within any music song or piece, rhythm helps to bring balance by providing a stable beat, much like the Wakan Tanka. Rhythm can help express the heartbeats of life, earthquakes of nature, or the flowing of a river. To study rhythm is to study the message and meaning of the Wakan Tanka. Densmore gave

humanity a gift when transcribing the healing song, she provided our modern society knowledge of the Wakan Tanka. As stated previously, a translation of the text is requisite to understand the healing song's significance.

WORDS

ate′ ..... father
hiyu′ye yo ..... come forth
hu noŋ′pa ..... a two-legged object (see footnote, p. 120)
maka′ta yuŋka′ ća ..... lying in the earth
piya′wakaġe′ ..... I have renewed
ate′ ..... father
hiyu′ye yo ..... come forth
ina′ ..... mother
hiyu′ye yo ..... come forth
hu noŋ′pa ..... a two-legged object
maka′ta yuŋka′ ća ..... lying in the earth
piya′wakaġe′ ..... I have renewed
ina′ ..... mother
hiyu′ye yo ..... come forth

(Densmore, pg. 269)

The above figure shows the words of the healing song. Having access to the translated text allows for more in-depth analysis of the song. Certain rhythms corresponding to certain words can change their meaning significantly. For example, the first measure contains the word *até*, meaning father. The rhythm of the previously mentioned word is a sixteenth note followed by a dotted eighth note. Every time the word *até* appears in the song it contains the exact same rhythm. The continuity of the rhythm implies that the word must have special emphasis and meaning onto it. The Sioux placed a great emphasis on fatherhood and male mentors in society; it would only seem logical that the word have rhythmic continuity to represent their importance and perpetuity. The phrase *makáta yunká ca*, translating to lying in the earth, all is sung on the exact same pitch. Perhaps the series of prime notes on the phrase could be to bring emphasis, creativity between words and notes implying that prime notes sound like being close to the ground, or to keep the melody agreeable to sing. Based on the evidence the most credible conclusion the notes are prime

are due to the spiritual connection with the rhythm. It has been stated previously that rhythm is the element of music most attractive to the human body. Keeping the notes prime over *makáta yunká ca* bring out the rhythmic quality and draw the listener closer to Wakan Tanka. Another example of the rhythm corresponding to the text can be found in measures eleven and twelve. The measures have two prime notes on the phrase *hiyu'ye yo*, which translates to come forth. The evidence again suggests that the rhythm is being utilized as a connection to the spiritual world. The notes are not only prime intervals in measures eleven and twelve, but both also have the same rhythmic value of a half note. Having such a simple rhythm and pitch implies that the Sioux leader must want the listener to pivot their attention on the words. The phrase meaning come forth shows that the leader is suggesting that the Wakan Tanka spirit is being summoned. The simplicity of the music in those measures may also suggest that uncomplicated melodies may bring the spirit of Wakan Tanka. Since Wakan Tanka is the essence of balance and peace, displaying simple music to the spirit might bring it into the patient.

Studying the technical aspects of the music in conjugation with the translated text showcases how the Sioux used music to heal. While one could see the differences in rhythm and melody as arbitrary, they bear immense meaning for healing. Both disciplines of music and medicine rely on explicit accuracy and precision, it is of no surprise that their synthesis is alike in that same fashion. Displaying Sioux healing music shows the depth of liberalizing the term medicine. When society believes in alternative healthcare through art, greater amounts of healing may be achievable, this becomes especially truthful in fields like immunology. Perhaps a great feat of musical medicine can be found in the ancient Egyptians.

ANCIENT EGYPT

Ancient Egyptian culture was defined by great architectural skill, innovations, and pioneering in mathematics and science. The culture is polytheistic believing in more than two thousand deities. The social organization in ancient Egypt was a theocratic monarchy, where the ruler is simultaneously the head of both government and religion. The ruler of the theocratic monarchy was called a pharaoh. The word pharaoh translates to great house, referencing the place where the ruler resides. The pharaoh was considered the bridge between the earthy realm and the spiritual, connecting directly to the gods. A major component to the role of pharaoh was maintaining peace and harmony. The pharaoh owned the land, collected taxes, and waged war. The society had one hundred and seventy pharaohs in total over the course of the empire. The civilization lasted over three thousand years. The society began in approximately 3100 BC and continued until the final pharaoh, Cleopatra VII, in 30 B.C. During that time, there were periods of political unrest and division, however, Egypt stayed as one united nation. After the demise of the empire, Egypt became a roman province. (Mieroop, *A History of Ancient Egypt*)

Egyptians believed that after people die in this world, they continue living in another world. Bodies were preserved through a process called mummification, a method of embalming or maintaining a dead body. Mummification was a very expensive process where mummies were placed in coffins and buried in tombs or graves. Magic spells were written in hieroglyphics on coffins and in tombs to offer protection from evil spirits. (Mieroop, *A History of Ancient Egypt*)

Most of ancient Egyptian can be divided into three distinct categories: the old kingdom (2686-2134 B.C.), the middle kingdom (2040- 1640 B.C.), and the new kingdom (1552- 1070 B.C.) The pre-dynastic periods precede the old kingdom. The earliest dynasties in Egypt started along the Nile River circa 5000 B.C., during this time Egypt was not united. Also during this time,

Egypt had two separate kingdoms: upper Egypt and lower Egypt. Even during these early stages, music played a central part in Egyptian life. (Mieroop, *A History of Ancient Egypt*)

A major component of Egyptian culture was their music as a form of expression. Music was an integral part of ancient Egyptian mundane life: being seen in farms, battlefields, workshops, temples, and palaces. The two Egyptian gods most affiliated with music are Hathor and Bes. Hathor was the goddess of both music and fertility, this made her a very popular deity. It is rather interesting that Hathor would be the goddess of both music and fertility. The word fertility comes from the Latin *fertilitas,* meaning fruitful. The ancient Egyptians compared the mere concept of being fruitful and having life to music. To an ancient Egyptian, music is not merely a form of art, but of life itself.

Some of the earliest Egyptian instruments included woodwind, percussion, and string instruments. Percussion instruments included the hand-held drums, bells, and the sistrum. Sistrum translates to rattle and was mainly used in religious worship services. The instrument was mainly made of clay, wood, or metal. The main role of the instrument was to provide rhythmic accompaniment for other instruments.



(Cartwright, *World History Encyclopedia)*

The sistrum has a strong correlation to the goddess Isis, the goddess of nature. The highest status that any musician could obtain was to be employed at a temple. Temple musicians were called *shemayets*, which simply translates to musician. If one were to be fortunate enough to hold this prestigious office, they were to praise a particular god or goddess. Musicians performing for royal families were held in great esteem as well. Musicians held in lower esteem were performers for festival or entertainment purposes. Important to note, music was not notated until the Graeco-Roman period (Excerpts from the Kelsey Muesum at the University of Michigan). Many instruments in ancient Egypt were assigned to a specific gender to play. For example, lutes and lyres were assigned to women. Like much of the ancient world, the modern barriers and divisions distinguishing between disciplines did not exist. Music was associated with science, philosophy, and religion. Specifically, music had a very close relationship with the astronomical sciences.

Perhaps the connection between music and astronomy acts as an emblem for ancient Egyptian reasoning. Modern astronomy is attributed to the works of Johannes Kepler, the German scientist who developed the three laws of planetary motion: planets move in elliptical orbits around the sun, a planet covers the same area of space as in the same amount of time no matter where it is in orbit, and a planet's orbital period is proportional to the size of its orbit (National Aeronautics and Space Administration Science Editorial Team). It is of note that in Kepler's magnum opus, *Harmonice Mundi*, he states that his ideas and thought structures came from ancient Egyptian understanding of the universe.

> "Now, eighteen months after the first light, three months after the true day, but a very few days after the pure Sun of that most wonderful study began to shine, nothing restrains me; it is my pleasure to yield to the inspired frenzy, it is my pleasure to taunt mortal men with the candid acknowledgment that I am stealing the golden vessels of the Egyptians to build a tabernacle to my God from them, far, far away from the boundaries of Egypt" (*Harmonice Mundi,* Kepler).

The previously mentioned quote shows the depth and grasp that Egyptian philosophy and music has on other disciplines. Music contains concepts of harmony, dissonance, tension, and release. It is of no surprise that such expansive topics like the ones previously mentioned fall into almost every discipline humanity has ever known. Kepler knew that the structures which allowed for musical harmonies were seen in the interactions of planets. Kepler articulated the same conclusion that other intellectuals had discovered during the scientific revolution of the 17th century -- science has a robust relationship with order and natural disposition. The main concepts of the scientific revolution involved challenging classical views of the natural world buttressed with observational reasoning. It is not merely a coincidence that both the ancient Egyptians and 17th century intellectuals took note of music's adjacency to natural discovery. Perhaps the value of studying ancient Egyptian musical medicine relies on its ability to connect to current medical

situations, much like how ancient Egyptian music facilitated Kepler's work. Kepler's third law allows for each planet to have its own musical tones as they orbit around the sun.



(*Harmonice Mundi*, Kepler)

In the above figure, Kepler shows in musical notation the tone of each planet. The scores of the planets are written in musical clefs that are not commonly used in modern western classical music. The names of the planets are written in classical Latin, much like the rest of his books. Mercury contains lots of notes and rises and lowers more dramatically than the other planet's tones. Venus has no variation in its musical notation. The concept of having planets relate to musical consonance showcases how instrumental ancient Egyptian philosophy is to modern science, including medicine. (University of Chicago, Department of Music). Important to note, the main contribution of ancient Egyptian musical medicine was its use of vibration. Their way of understanding healing through vibration paved the way for modern astronomy and musical medicine. Ancient Egypt's healing relied heavily on the use of frequency and vibrations. Vibrations were seen as a direct link for communication with certain gods and goddesses. In fact, there is evidence to suggest that ancient pyramids were manufactured with acoustics in mind.

Ancient Egyptian medical practices incorporate much of the same medical values that we use today. Ancient Egyptians believed in cleanliness, immunity, and use of herbal remedies. Musically, they believed that sound alone could have a healing effect on the body. The sistrum was used during

healing ceremonies to invoke divine intervention to bring healing to the patient, much like the Navajo and Sioux. The sounds were used to connect the divine realm with the physical realm. The ancient Egyptians believed that sound through musical instruments' frequencies could have profound effects on healing.

A famous musicologist by the name of Laurel Elizabeth Keys was a leader in understanding how vibrations were used as healing in ancient cultures. Keys compiled her work in a book entitled *Toning,* The *Creative Power of the Voice.* Toning is a healing vocal technique in which the patient makes an elongated vowel sound for an extended period of time. Priests in the temples would include toning as a healing ritual. Keys suggests that toning is not merely a relic of musical medicine's past. On page ten of *Toning,* Keys proposes that our physical body has its own voice, a creative force that is normally enslaved by the mind. Keys goes on in the book claiming she taught toning to a woman who suffered from mononucleosis, contagious infection caused by a herpes virus called Epstein-Barr. The symptoms of mononucleosis include fever, sore throat, swollen lymph nodes, and body aches (The Mayo Clinic Staff, 2022). When the woman and Keys practiced toning together, the woman's health markers improved greatly. The next day she was out of bed doing housework. On the third day she drove to a nearby town to hear a lecture. There was no return of her disease. She seemed to be doing better than before she was diagnosed with mononucleosis. (Keys, 1973, pgs. 24-26) While Keys is a modern example of vibrational medicine, the framework of this technology was derived from ancient Egyptian discoveries and ideas.

During worship rituals in the ancient Egyptian temple, priests would chant or sing to a particular god or goddess for healing. The repetition of sounds and phrases had a healing effect on the body, like previously discussed in other cultures. Another important aspect of ancient Egyptian worship services was honoring a deceased person. During funeral services, a dirge, a lament for

the dead, was performed. The dirge was performed to honor and guide the ancient Egyptian soul into the afterlife. The journey into the afterlife was a series of challenging tasks that involved going into the underworld, called the Duat. The spirit of the deceased person had to pass tests to prove their worth to be entered into heaven, called the Field of Reeds (Mieroop, *A History of Ancient Egypt*).

Music in the society was multifaceted and showcased ancient Egypt's holistic view of the world. While the musical medicine in ancient Egypt may be seen as lackluster when juxtaposed with cultures such as the Navajo and ancient Greeks, their contribution and expertise of vibrations were instrumental in the development of musical medicine. It only seems logical that vibrations and music are an inseparable pair, the ancient Egyptians used their holistic view of medicine to allow for future innovations. As the story of humanity's past often necessitates its future innovations, modern musical medicine can seek wisdom through the rich history of its forefathers.

MUSIC AS MEDICINE IN THE MODERN LENS

With modern medicine advancing at a rapid pace, it is only logical that the combination of the two is advancing swiftly as well. The American Music Therapy Association (AMTA) defines music therapy as clinical & evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program. Music therapy can be used to treat a variety of physical and mental challenges such as to promote wellness, manage stress, alleviate pain, and promote physical rehabilitation. Music as a form of healing can be seen in almost all modern medical landscapes such as hospitals, schools, outpatient clinics, and skilled nursing facilitates. Specific branches of modern medicine embrace musical concepts such as immunology, cardiology,

neurology, psychiatry, and pulmonology. Modern science has a more robust understanding of how music occurs in the body naturally.

It is of utmost importance that a distinction between music therapy and musical medicine is observed to create a strong understanding of both. Music therapy has been defined by AMTA previously in the paper. Musical medicine is the broader use of sounds, vibrations, and resonances for healing in a medical context. Music therapy employs a combination of evidence-based practices for specific physical and emotional needs, musical medicine is a tool for healing. Music therapy is a modern practice that has only been legitimized in the United States of America since the inauguration of AMTA in 1950. As discussed previously, musical medicine is an ancient art.

Modern medicine has enjoyed a profound growth in the 20th and 21st centuries. Much of our understanding of the integrity of medical institutions was developed in the 20th century. For example, vaccines such as the vaccinia vaccine to treat smallpox played a crucial role in public health. In order to gain insight into the integration of music in medicine in the modern era, an interview with Ms. Emily Oaks, the president of the Maryland Association of Music Therapy, was conducted. Ms. Oaks is a board-certified music therapist and firm believer in the integration of music as medicine. In the following interview, she shared her professional insights, personal background, and expertise.

Interviewer: “How did you discover music therapy?”

Emily Oaks: “I discovered music in high school, and I felt that the performance route was not for me. My brother has autism and through his medical experiences I saw how powerful music can be. I then shadowed music therapists.”

Interviewer: “What patients did you treat during your tenure in private practice?”

Emily Oaks: “I saw geriatric patients and worked in private homes working with adults with developmental disabilities. I also saw children with mental health needs. I worked in a facility with registered sex offenders coming out of the prison system. There really is no limit to the demographics that music can reach and help.”

Interviewer: “How would you describe modern music therapy in laymen’s terms? What types of conditions can music treat?”

Emily Oaks: “Music therapy works toward nonmusical goals using music as a tool. The goal is not to teach a patient an instrument, rather using music to treat patients with emotional, physical, and mental conditions. Music can help with social skills, trauma, some hospitals even using music therapy for heart and oxygen conditions.”

Interviewer: “When you were in university, how was music therapy taught? Did they teach music therapy from various perspectives?”

Emily Oaks: “My university taught music therapy from lots of different perspectives. One class taught the psychology of music, another class taught behavior modification. I took courses in anatomy and physiology as well as abnormal behavior. To study music therapy, one has to be a jack-of-all-trades. Since this field is so young, it is fascinating to see its development.”

Interviewer: “With all your expertise in music and healthcare, do you believe that music is an important aspect of a collegiate education? Is musical education a fundamental ingredient in a liberal arts curriculum?”

Emily Oaks: “Absolutely, any institution benefits from having music be a part of its curriculum. There are so many different paths in music as a profession. A student could become a conductor, performer, music therapist, teacher, etc. So many colleges see music simply as a performance art and neglect its overall role in society. Obviously, working on music as a

performance and craft is important, I am simply saying there are so many careers and possibilities in music. Music is seen in a lot of various fields, having musical knowledge is important."

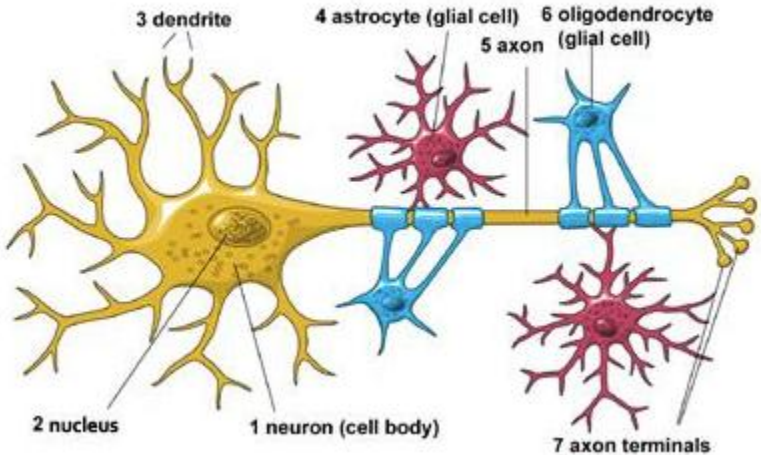
Ms. Oaks revealed and elaborated on modern music therapy, music education, and music's ability to heal. She emphasized that music's ability to heal is very extensive. It is important to note how Oaks showcases music's ability to achieve nonmusical goals. Most people in modern society see music simply as an artform or craft, that opinion ignores thousands of years of experience and wisdom from humanity's greatest thinkers. Music has aided Kepler's discoveries of planetary motion. Music as a tool in medicine has been perfected by thousands of years of experience. Although music therapy as a certified field is young, the combination of music and medicine is very old.

Modern musical medicine has made tremendous strides in the field psychoneuroimmunology, the field of study that explores the interactions between the brain, nervous system, endocrine system, and immune system. As stated earlier, music and physiology both rely on balance and release of tension. The field of psychoneuroimmunology also relies heavily on the concept of tension and release. One could argue that hormones are only secreted in response to a specific tension in the body. Before one can begin to understand and appreciate the musical aspects of medicine in relation to psychoneuroimmunology, clear definitions must be established and explained.

The endocrine system, the biological system involving a network of glands and organs that produce hormones to regulate many of the body's functions, relies strictly on balance and homeostasis. Hormones are chemical messengers produced by the body's endocrine glands. The primary use of hormones is chemical communication in the body. Hormones travel through the bloodstream to specific target organs where they exert very specific chemical messages. For

example, insulin is a hormone secreted by the pancreas and plays a crucial role in regulating and balancing blood sugar levels. After the ingestion of food, the pancreas releases a hormone called glucagon that causes blood glucose levels to rise. When blood glucose levels get too high, insulin is released by the pancreas to keep them within a normal range (The National Institute of Diabetes and Digestive and Kidney Diseases Staff). Much like the endocrine system, the nervous system acts as the body's communication network, collecting data from both inside and outside the body. The nervous system sends signals to initiate our thoughts, movements, and vital functions. The main difference between the nervous system and the endocrine system is that the nervous system uses electrical impulses to send communication while the endocrine system uses hormones to target certain organs. Also, the electrical impulses of the nervous system are much faster than the endocrine's hormone secretion.

The most basic component of the nervous system is the neuron. A neuron is a nerve cell that carries electrical impulses to specific areas of the body. A neuron's message allows us to talk, eat, walk, and think. A neuron sends messages from the brain to the spinal cord, and through the entire body. A neuron has three basic parts: the cell body, an axon, and the dendrites. The axon's primary role is to send messages from the cell. The dendrites receive messages from the cell. The cell body provides energy to the cell, maintains structure, and contains genetic material (The National Institute of Neurological Disorders and Stroke Staff).

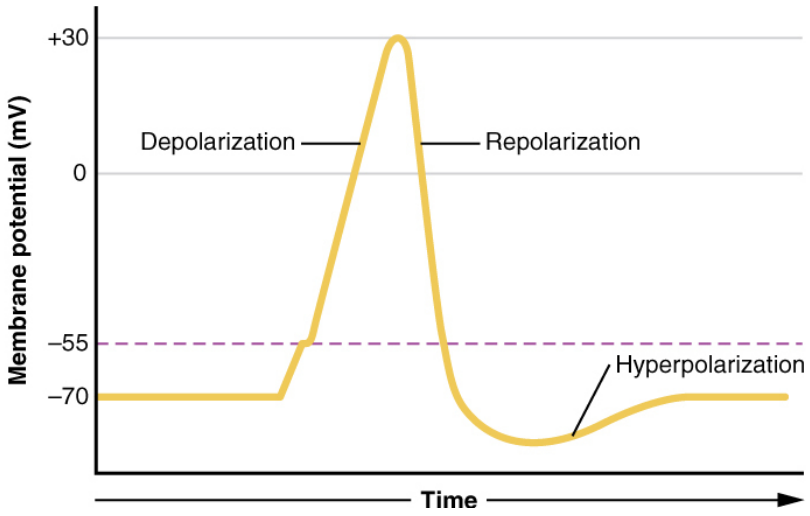


(National Institute of Neurological Disorders and Stroke)

The above figure shows a neuron and its parts. Neurons travel through a phenomenon known as action potential, a physiological process that facilitates transmitting electrical signals. All neurons have a cell membrane, also called axolemma, which is a structure that separates the inside of the cell from the exterior environment. It is important to note, there is a junction between the axon of one neuron and the dendrite of another called a synapse. This junction between two neurons is where communication occurs. Cell membranes are made of phospholipids, a type of lipid molecule essential for cell membrane functioning. A lipid is a fatty, waxy, or oily compound that is soluble, meaning it can be dissolved, in organic materials and insoluble in water. A phospholipid is a type of lipid known for its amphipathic nature, meaning it has a hydrophobic head and two hydrophobic tails. (The University of Queensland Brain Institute Staff).

Action potential is a very quick change in electrical potential of a cell membrane that serves as the basis for all neuron communication. All mammalian species rely on action potential to be the primary mechanism for transmitting electrical signals throughout the nervous system. The resting potential in a neuron is equal to -70 millivolts (mV). When there is stimulation found

on the receptors of the dendrites found in a neuron, it has an effect on the neuron known as depolarization. Depolarization is the effect of making the membrane potential less polarized and causing it to get closer to 0 mV. When neurotransmitters interacting with the receptors of a neuron cause repeated polarization, eventually the neuron reaches what is known as its threshold membrane potential. When the threshold is reached, an immense amount of sodium channels opens which allow positively charged sodium ions into the cell. The forementioned opening of the neuron causes a mass depolarization of the neuron. This influx of positive ions creates an electrical signal known as the action potential, which travels throughout the neuron. Eventually there is a peak in the action potential when sodium channels close and potassium channels open. The loss of positive potassium ions causes repolarization, the neuron than attempts to return to resting membrane potential but the cell results in being hyperpolarized. The period of hyperpolarization is known as the refractory period. Eventually, the membrane returns to resting potential.



(U.S. National Library of Medicine, National Institutes of Health)

The above figure shows the process of action potential and its relationship to time and membrane potential.

The immune system is a network of cells, tissues, and organs that work together to protect the body from infections and disease. The main function of the immune system is to recognize and eliminate foreign substances, known as antigens, that can have a negative effect on the body. Now that a solid understanding of the fundamental aspects of psychoneuroimmunology has been explained and understood, it is now appropriate to see music's role in healing while using it.

Clinical Epidemiology and Global Health, a peer-reviewed Indonesian science journal published a 2021 article about intensive care unit (ICU) induced anxiety and physiological parameters among ICU patients. The article showcases an experimental study that takes place in a tertiary care hospital in India. Dr. Jaskirat Kaur Chahal discusses how he operationalized anxiety in the article, "Anxiety is a circumstance of apprehensiveness, inconclusiveness, or angst feeling resulting from the anticipation and preconception of the realistic or imaginary threatening event or situation. It may consist of behavioral, cognitive, emotional, and physical components. The exhibition of symptoms varies individually and gets aggravated by loneliness, manipulation in daily routine, exposure to the new or strange environment too. The disturbance in physiological and psychological functions can lead to an increase in mobility and mortality rates, therefore, its diagnosis and management are essential along with other curative measures" (Chahal et al., pg. 2). The definition of anxiety that Dr. Chahal used is certainly encompassing and covers an array of symptoms for anxiety. An experimental research approach was used with two groups of thirty-five patients. One group received twenty-minute tailored music therapy in addition to standard treatment thrice a day for three continuous days. The other group only received the standardized treatment. The socio-demographic sheet, clinical profile sheet, Zung Self Rating Anxiety Scale (SAS) and physiological parameter sheet were used to measure study parameters (Chahal et al.,

pg. 2). The participants came from diverse socioeconomic, religious, cultural, and familial backgrounds.

The SAS is a twenty-similar item, self-report questionnaire which measures the presence and magnitude of anxiety-based symptoms. The anxiety scale was constructed according to the DSM-II criteria for anxiety and still has the criteria listed in the Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision DSM-IV-TR (APA, 2000), giving it good content and face validity. Face validity is the extent to which a test is subjectively viewed as covering the concept it purposes to measure. Essentially, it measures the validity of a test if it appears to measure what it is supposed to.

	A Little Of The Time	Some Of The Time	Good Part Of The Time	Most Of The Time
1. I feel more nervous and anxious than usual.	○	○	○	○
2. I feel afraid for no reason at all.	○	○	○	○
3. I get upset easily or feel panicky.	○	○	○	○
4. I feel like I'm falling apart and going to pieces.	○	○	○	○
5. I feel that everything is all right and nothing bad will happen.	○	○	○	○
6. My arms and legs shake and tremble.	○	○	○	○
7. I am bothered by headaches neck and back pain.	○	○	○	○
8. I feel weak and get tired easily.	○	○	○	○
9. I feel calm and can sit still easily.	○	○	○	○
10. I can feel my heart beating fast.	○	○	○	○
11. I am bothered by dizzy spells.	○	○	○	○
12. I have fainting spells or feel like it.	○	○	○	○
13. I can breathe in and out easily.	○	○	○	○
14. I get numbness and tingling in my fingers and toes.	○	○	○	○
15. I am bothered by stomach aches or indigestion.	○	○	○	○
16. I have to empty my bladder often.	○	○	○	○
17. My hands are usually dry and warm.	○	○	○	○
18. My face gets hot and blushes.	○	○	○	○
19. I fall asleep easily and get a good night's rest.	○	○	○	○
20. I have nightmares.	○	○	○	○

(Zung WW, 1971)

As the figure above suggests, the questions asked on the SAS cover anxiety's symptoms from an emotional, psychological, and physiological perspective. The scale also tests for the somatic nervous system as well as the autonomic nervous system. The somatic nervous system controls voluntary movements of skeletal muscles, while the autonomic nervous system regulates involuntary responses, like heart rate and breathing. For example, question ten states "[I] can feel my heart beating fast." The previous question would be an example of the somatic dimension of anxiety. The test is scored in which that each item is against a 4-point rating scale in relation to whether the person has experienced each specific symptom none or a little of the time (rating = 1), some of the time (2), a good part of the time (3), or most or all of the time (4) during the last two weeks (Zung WW, 1971). Raw scores for the SAS come up to a range of twenty to forty-four denoting normal anxiety levels, forty-five to forty-nine denoting mild to moderate anxiety levels, sixty to seventy-four denoting marked to severe anxiety levels, and seventy-five to eighty indicating extreme anxiety levels (Chahal et al., 2). Obviously, the higher the numerical score, the higher the level of anxiety is correlated with it. Important to note, the test-retest reliability of the SAS came to r = 0.83 (Chahal et al., 2). Test-retest reliability measures the consistency of a test or assessment over time by administering the same test to the same people at different times. Test-retest reliability is a test using a statistical measure known as the intraclass correlation coefficient (ICC). The ICC is scored ranging from zero, meaning no agreement, to one which would mean perfect agreement. This means that an ICC score of r =0.83 is respectable.

In the experiment, a true experimental research approach with two group pre-test post-test research design was used for this study. The study groups consisted of experimental and a conventional care group. Music was provided by headphones connected to a MPEG Audio Layer-3 (mp3) which had pre-stored selected interventional music. The intervention was also validated

by a designated music expert. Physiological measures were recorded via a parameter recording sheet by the experimenters. The physiological measures recorded were temperature, pulse rate, respiration rate, systolic blood pressure, diastolic blood pressure and oxygen saturation. The pulse rate and respiration rate were measured by the investigator manually in beats per minute and breaths per minute respectively. Systolic and diastolic blood pressure was measured by the same sphygmomanometer throughout the study in millimeter of mercury (mmHg).

Physiological parameters	Range for Normal	Range for Abnormal
Body temperature (degree of Fahrenheit)	98–99	<98 or >99
Pulse rate (beats per minute)	60–90	<60 or >90
Respiration rate (per min)	16–24	<16 or >24
Systolic Blood pressure (in mmHg)	110–139	<110 or >139
Diastolic Blood pressure (in mmHg)	70–89	<70 or >89
Oxygen saturation (in percentage)	>91%	<91%

(Chahal et al., pg. 3)

The above figure shows range for both normal and abnormal physiological parameters. Oxygen saturation refers to the percentage of oxygen in the blood, it measures how much oxygen is bound to hemoglobin. Hemoglobin is the protein in red blood cells that carry oxygen throughout the body. An individual having low oxygen saturation can potentially lead to their body's organs not functioning properly (The Cleveland Clinic Medical Staff, 2025).

Table 5
Comparison of baseline and post-test mean score for anxiety in experimental and control group (N = 70).

Outcome variables		Baseline score Mean (SD)	Post-test score Mean (SD)	Paired *t*-test	df	p value
Anxiety	'Experimental' (n = 35)	57.829 (3.04)	45.971 (5.32)	15.136	34	<0.001***
	'Conventional care group' (n = 35)	58.06 (2.96)	59.086 (3.26)	−1.729	34	0.093

*** Highly significant at level of <0.001.

(Chahal et al, pg. 5)

The figure above shows the results from the SAS of both the pre-test and post-test. The results were recorded by performing a paired t-test. A t-test is used to evaluate whether a single group differs from a known value. A paired t-test simply compares the means of related, also known as paired, groups. The post-test score for the experimental group was 5.32, while the conventional care group had a pre-test score of 59.086. The results of the paired t-test for the experimental group were 15.136 and -1.729 for the conventional care group. The p-value, also known as the probability value, indicates the probability of obtaining results as extreme or more extreme than ones recorded. Important to note, the p-value shown assumes the null hypothesis is true. A null hypothesis is a type of statistical hypothesis that assumes there is no statistical significance in a set of given observations. The p-value for the conventional care group was 0.093, while the experimental group's results were highly significant. The results of the experiment in Table five displayed very promising numerical values for the combination of music and medicine. Table five showed that music therapy was highly effective (t = 15.136 (34) p=<0.001) in reducing anxiety after the intervention.

Table 7
Comparison of experimental and conventional care group at post-test (Day 4) with regards to selected physiological parameters. (N = 70).

Physiological Parameters	Category	Experimental group (n = 35) f	Conventional care group (n = 35) f	χ2 value (df)	p value
Temperature	Normal	26	15	7.12 (1)	0.0075**
	Abnormal	9	20		
Pulse rate	Normal	25	12	9.68 (1)	0.0017**
	Abnormal	10	23		
Respiration rate	Normal	25	13	8.29 (1)	0.0039**
	Abnormal	10	22		
Systolic B.P.	Normal	27	15	8.57 (1)	0.0033**
	Abnormal	8	20		
Diastolic B.P.	Normal	28	15	10.19 (1)	0.0013**
	Abnormal	7	20		
Oxygen saturation	Normal	33	24	7.65 (1)	0.0056**
	Abnormal	2	11		

The above figure shows the physiological parameters' results. Music therapy was effective in stabilizing physiological parameters. As discussed earlier, psychoneuroimmunology has a

distinct connection to musical elements. Since music is such an effective form of communication, it is only logical that psychoneuroimmunological parameters are enhanced when the body and mind are in favorable and beneficial contact. The study found that music therapy was highly effective in reducing ICU induced anxiety and stabilizing physiological parameters among patients who are admitted in ICU's during post-test as compared to conventional care group where no intervention was given except routine care. The limitations of the study included the small sample size of only seventy participants and the short period of days in which the study took place (Chahal et al, 6). The findings of Dr. Jaskirat Kaur Chahal and his team prove that music can be an effective form of medicine in the modern era. Musical medicine is simply not just a remedy of the past; it is an effective healing tool that has an appropriate place in any medical institution. ICU patients have a very special lens for uncertainty and fear. If music can reach that audience, as displayed by Dr. Chahal's research, it can aid in many more medical situations. To further enhance the article's findings, it is appropriate to apply the scope of nontraditional forms of music as medicine in the modern era. Music aids psychoneuroimmunological healing through innovations such as in digital software applications, holistic healthcare, and artificial intelligence.

With the rise of the sheer quantity of applications on cellphones in the 21st century, it is only natural that some involve healing. One specific application, Brain.fm, is a neuroscience-based audio platform that generates music designed to enhance focus, sleep, and overall health by subtly modulating brainwaves. Brainwaves are small electrical currents that can be measured by the number of vibrations, or waves, per second. Brain waves are expressed in hertz (Hz) and can be measured by an EEG. Brainwaves become apparent when many neurons firing action potentials in a synthesized fashion. The scientific nomenclature for brainwaves is neural oscillations. Brain.fm works by changing different patterns of the forementioned phenomenon, causing more

or less electrical movement in the brain. There is currently not enough clinical evidence to support whether or not Brain.fm is functional for adequately modulating brainwaves. Another example of the combination of music and medical interventions that has reliable sources is the *Muse* headband. The headband uses electroencephalography to detect and interpret neural oscillations; the device will then take the information and give the user a set of guided music to help them function. For example, if the headset detects that the user is irritable and needs sleep by detecting specific neural oscillations, it will suggest music to help facilitate sleep. The device connects to a cellular phone via Bluetooth and gives results instantaneously. Unlike Brain.fm, the National Library of Medicine has peer-reviewed experiments and articles behind their product. In addition to listening to music, the headband wearers can use certain sounds such as lightning or rain to help modulate neural oscillations. Scientific and medical innovations can also manipulate sound to have the brain perform a specific response.

Binaural beats are an auditory illusion that is created when slightly different frequencies are presented in each ear, which the brain perceives as a single tone. The act of interpretation of the beats from the brain is said to have profound healing effects on psychoneuroimmunological parameters. While there are scientific peer-reviewed articles and experiments that help to aid the findings in the previous claim, there is simply not enough evidence to make a sound scientific statement. Since modern medicine has realized the benefits of music on psychoneuroimmunological markers, there is a strong need for robust scientific research. Another example of an application is Endel, a music selection software that utilizes artificial intelligence. The application works by having the user fill out certain questionnaires and asses their individual needs. The software then uses artificial intelligence to use music as a tool. One could make the

argument that Endel is using the same concepts as a board-certified music therapist. However, there is not a replacement for in-person music therapy with a certified clinician.

One of the most exciting and fresh uses of music as medicine is its use in patients with Alzheimer's disease. Alzheimer's disease is a neurodegenerative disease that damages the brain's memory, thinking, and reasoning skills. Music & Memory, a service of the Institute for Music and Neurologic Function (IMNF), is a leader in developing solutions that aim at helping individuals with Alzheimer's disease improve their cognitive and physical challenges. The idea behind IMNF is that playing or performing certain pieces of music may reverse the negative symptoms of Alzheimer's disease. The institute is committed to advancing research and education in music therapy. Important to note, unlike the applications discussed previously, IMNF exclusively relies on peer-reviewed experiments and articles for their clinical work. In fact, their website has an entire page dedicated to recent findings in the field of neurology and music. The website contains articles about subcortical information processing to maximize rehabilitative outcomes, music therapy improving the cognitive functions of geriatrics, and how music therapy can help loved ones affected by the negative effects of Alzheimer's disease. With all of the developments in using music as medicine, it is only natural that research is going to be more coherent and robust in the future. The future of medicine as music continues to be bright with new clinics being erected dedicated to musical medicine, new music therapists hired in hospitals who specialize in psychoneuroimmunological focused treatments, and further innovations occurring at a rapid pace. While attempting to create an equilibrium between music and medicine is an ancient art, the human spirit of innovation and discovery is new.

A DEFENSE OF MUSICAL EDUCATION AT THE COLLEGIATE LEVEL

While the prior benefits and history of music as medicine have been discussed, in order for this field to continue music must be continued to be taught at the collegiate level. Although many still see music as a staple of a classical education, many universities are closing and removing the department all together. The reasons for this seem to be multifaceted: the job market for music is not as secure as other fields, classical music is seen as an antiquated artform, and limited funding for collegiate education. While the forementioned reasons seem logical, there is a spirit of curiosity that is lost when a music major is taken away from an available list of majors for a first-year student. Music provides crucial teaching in creativity, critical thinking, emotional intelligence, and culture. As mentioned before, music is a colorless, tasteless, and odorless artform. Besides the instruments themselves, there is nothing tangible about the artform. One could argue that since music lacks other components, such as visual and scent aspects, the artist must be forced to become more creative. The way one must strum a chord on a guitar, strike a piano key, or sing a note must utilize thought and perseverance. Any liberal arts education espouses to teach skills in creativity and promote interdisciplinary studies. Musicians must be fluent in interdisciplinary fields because of the restraints mentioned earlier. To be a musician, one must be proficient in history, culture, anatomy, and language, among many other things. If a liberal arts institution does not give proper care and thought to their values, the institution becomes extinct from purpose. This paper has discussed science, medicine, and history, all because music requires competency in those fields. To sing properly requires anatomical knowledge; to analyze any piece of music requires historical knowledge, the interdisciplinary application of the previously mentioned skills becomes deceased when a music major is destroyed. Music as medicine can only exist with knowledge of both music and medicine. The interdisciplinary application of treating a Alzheimer's disease with musical interventions may not occur without musical education at the collegiate level. The more music is

stripped away from a college education, the more a college does not benefit from the benefits of interdisciplinary study.

Musical education provides the opportunity to combine intellectual study with emotional expression. The benefit of practicing emotional expression is that it can aid in problem solving abilities and teamwork collaboration. Teamwork collaboration is a crucial aspect of any profitable job and thus has valuable transferable skills in the marketplace. The skills gained through a music major are discipline, creativity, and teamwork. Also, being a music major connects the college with its local community through concerts, recitals, and more nuanced networking. Maintaining college music majors enriches the academic environment as a whole.

To conclude the general findings of the essay, music as medicine has its developmental roots in the ancient Greeks, Native American Indigenous tribes, and the ancient Egyptians; all of these cultures created a different perspective on the field and manufactured practical innovations. From a historical perspective, their clinicians and healers were crucial to paving the way for modern innovations and discoveries. New discoveries through a psychoneuroimmunological lens show how more current peer-reviewed experiments are needed. Further, robust research into this topic can aid in further healing and can thus help eliminate human suffering; in order for this to happen, music must remain a part of collegiate education. Important to note, healing does not discriminate between ancient and modern practices. Hopefully, the marriage between music and medicine can help inspire academics for the creation of new interdisciplinary fields. If the amalgamation of music as medicine proves anything, one may never know the findings that can occur in the least likely of places.

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