

# HOW I USE MUSIC TO HEAL



I was honored to have my work highlighted in two feature films: Actress Julia Ormond portrayed a character based on my career as a music therapist in the 2011 movie, *The Music Never Stopped*, and my insights into music's healing power inform the 1990 film *Awakenings* with Robert De Niro and Robin Williams. Both of these movies are based on the works of my renowned colleague, Oliver Sacks, MD.

Fortunately, Hollywood is not the only place intrigued by music therapy. The field has gained international attention for its positive effects on a host of neurologic conditions, including stroke, trauma, dementia, Alzheimer's and Parkinson's disease.

My doctorate is in music therapy and I've been a music therapist for nearly 35 years. When I started in this field I worked with kids who had special needs, which was amazing because children who couldn't speak became verbal in the context of song and melody. Children with poor balance and motor control could walk once they were stimulated by music.

I also saw improvement in patients with end-stage dementia. Though this group supposedly had no awareness of their environment or themselves, they could sing the words to songs. Seeing that someone could recognize a song when they couldn't recognize a loved one surprised me. It also motivated me to understand how music affects the brain and if we can learn how to apply music therapy to assist people with a wider range of neurologic needs to maintain or enhance their function. The very first study we got funded looked at music as a memory enhancer for those with Alzheimer's and dementia.

Science is just catching up to what we're doing. Only in the past 10 years or so has it begun to look at the clinical

or treatment aspects of music therapy, which became a formal profession in the late 40s, early 50s in the US.

One of the neuroimaging studies published a few years back by faculty at UC Davis showed that when music of personal importance is presented to college students, there's an area of the brain that recruits various processes, such as awareness of self, awareness of others and feelings of happiness. These areas converge and light up in the medial prefrontal cortex. By involving so much of the brain and so many functions, music works to recruit multiple networks simultaneously, enhancing memory, processing ideas and facilitating certain physical activities.

A study on depression that came out a few years ago shows that using music therapy also serves to improve mood and enhance physical rehabilitation and motor function.

In one study, we had people who couldn't lift their arms above their wheelchairs and were no longer in an active occupational therapy program. We created an environment where we used digital drum pads that were linked to electronic music equipment. We gradually increased the height of the drums every session. By the end of three months, people who in the beginning couldn't lift their arms, could lift them about 45 percent higher.

When people with traumatic brain injury or other types of cognitive problems have difficulty focusing on multiple-step challenges, music enables them to keep on task for longer periods of time and progress through the tasks.

Some of the really fine evidence-based neuroscience is being published out of Gottfried Schlaug's lab at Harvard Medical School. He's using melodic intonation therapy to



help people recover their ability to speak after a stroke. His recent papers have shown changes on the right side of the brain as people regain their ability to speak following intensive music-based technique.

Schlaug's team has received a major National Institutes of Health grant to replicate these techniques with children who have autism and experience language delays. They've already published a paper or two about how the children are improving in word usage. His lab probably has the best neuroscience study on music and language in children with autism.

Studies also show that children with autism who undergo programs in music therapy improve in social integration and self-awareness.

Rhythmic auditory stimuli helps people with general motor problems and those with Parkinson's to organize and improve their gait. Scientists tend to use terms like "timing mechanisms" or "frequency mechanisms" over "music therapy," and proposals with more clinical-sounding names sometimes get funded over proposals that use the simpler phrase "music therapy." Yet music is still being used as a stimulus in a very directed, prescriptive way that enhances function.

A study that we finished a year and a half ago looked at medically complex adults who were living at home and receiving managed care. We trained the direct caregiver in therapeutic techniques such as music and relaxation and music and exercise, in order to better engage and motivate the person for whom they were caring.

While the study didn't show conclusively the impact on the client, there was a clear change in the level of the caregivers' burden. They felt that their level of stress was reduced because they were engaged with the music and the patient was not as demanding on their time and energy. The patient may also have been distracted from their daily needs or their pain and may have been less needy.

Twenty-five years ago, when neuroscientists started looking at chaos theory and complex neural networks, they realized that music gave them entrée to explore the multi-levels on which the brain operates. But there was no way to look at the brain in real time until the invention of fMRI (Functional Magnetic Resonance Imaging). Recently, President Obama announced funding to map brain function. This will allow scientists and engineers to create diagnostic and evaluation equipment that looks at the brain in real time, tracking its circuits as they become alive with stimulation.

My hope is that in the very near future, we'll be able to develop more specific therapies in the areas of neurologic rehabilitation, including language recovery, mood, physical function and motor control, as well as cognition. These are areas where music plays an important role in therapy and has been shown to be effective.



Film premiere of *The Music Never Stopped*—titled from a Grateful Dead song. Based on a true story, *The Last Hippie*, by Dr. Oliver Sacks. Left to right: actress Cara Seymour, director Jim Kohlberg, Dr. Concetta Tomaino and Grateful Dead drummer, Mickey Hart.

If we can bring attention to the underlying neural mechanisms that we arouse in the auditory system, we'll be able to achieve a level of validation needed to allow music therapy to become more widely recognized as a clinical intervention.

Unfortunately, very few states currently reimburse for music therapy. Medicaid won't cover it. So being able to document how sound can excite and arouse dominant networks is critical. There's a lot of promise in neuroimaging research, but we need to build better testing equipment.

One of the most amazing things to see is how differently someone with Parkinson's moves to music vs. how they move without it. The science of being able to stimulate a pulse in basic motor areas of the brain is well documented and is the basis of the film *Awakenings*, which highlights the link between music, brain stimulation and movement.

De Niro played a role based on one of my private patients, whom they used as a model for what it's like to have Parkinson's. The real "Awakenings" case happened with my colleague, Dr. Sacks, a few years before I came to the facility. The other movie based on our work—*The Music Never Stopped*—is about a young man with a brain tumor whose memory is recovered through music.

There are plenty of YouTube videos that show somebody dragging their foot and shuffling when the room is quiet and then when the music is turned on that same person begins to walk. It speaks to how powerful music is in organizing the neurologic networks that inform our motor function and coordination.

Another well-known person I worked with was a musician who'd had a major stroke and could no longer speak or sing, but by using music that he had recorded, he was able to regain all of his speech within a few months.

An *American Idol* contestant had a major stuttering



# World Science Festival

## Reawakening the Brain through Music



World Science Festival 2012

Moderator - Lesley Stahl with Oliver Sacks, MD, Concetta Tomaino PhD, Petr Janata, PhD, and Stanley Jordan

problem, but could sing without a problem, which shows you the difference in dominance between speaking and singing. When someone's trying to speak—especially someone who stutters—they're conscious of what they're trying to say, so they break the flow of speech and are constantly editing and monitoring themselves. That's a frontal cortical activity.

When somebody's singing, they recruit their speech networks differently. They're not consciously editing or censoring or planning what they need to do and the music and words flow—a different process altogether. When we work with people who stutter, we actually incorporate the flow of rhythm and melody in their regular speaking, so that they're focusing more on the rhythm of what they're saying than the actual words, which inhibits their monitoring mechanism.

The auditory system has a straight connection to the part of the brain called the amygdala, where you find the fight-or-flight mechanism. Some people say music soothes the "savage beast," but the original quote used the words "savage breast." It means that people or animals respond to certain stimuli out of fear, but music usually doesn't invoke the fear response. If the music being played is pleasing to them, it allows a person to feel safe and secure. Music can also comfort Alzheimer's patients who may be agitated, particularly if the music is of personal importance to them.

Our own musical network gets created from the moment we're born and the more we listen to certain types of music the more we have associations with those particular pieces of music. Associations to personally preferred music can be one of the strongest ways to reach a person with memory loss.

We start creating our responses and associations to music from day one. Even five months in utero, we're already creating the ability to remember sounds. At

birth, we can detect rhythm. Infants are able to make sense of the sounds around them and their brains are learning language as well as the shapes of sound.

The contour of language, the sound of it and even the silences are what give it meaning. The ups and downs and inflection inform the words as much as the words themselves. Language is musically based. Asian-speaking people tend to have a larger language area on the right side of their brains, because of the musical base how they speak. At least that's what I've heard.

There was a study published recently about a sea lion that was able to move to music rhythm. It had previously been thought that rhythm and dancing to music were human-only responses, but Snowball is a cockatoo that has been studied by scientists because he's able to move rhythmically to music. Scientists believe that cockatoos being able to process rhythm is closely aligned with communication because cockatoos do mimic human sounds. But since the sea lion doesn't do that, this is the first evidence that another animal is able to move to and process the rhythm in music.

In the coming months, I'll be publishing some of our studies, writing grants and doing fundraising. That's an important part of my job as we're located in a part of New York City where people face challenges paying for music therapy. The rest of my time will be spent lecturing and training music therapists who come here from around the world to learn this healing technique. ■ **ABILITY**

by Chet Cooper and Concetta Tomaino,

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