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Research



The Institute for Music and Neurologic Function is considered one of the country's leading resources on questions concerning the impact of music on brain function.



THE IMPORTANCE OF MUSIC AND BRAIN RESEARCH

Executive Summary:

Although music has been an aesthetic part of our world for centuries, the study of its therapeutic effects gained intensity in the last half of the 20th century. Interest in music's healing powers has accelerated in response to the growing scientific study of cognition, perceptual neuropsychology, brain development and function, audio engineering and psychoacoustics. The development of music therapy as a discrete clinical discipline has also been a key factor.

The majority of research over the last forty years has focused on music perception and performance. Today basic science continues to yield promising new information about the neuroscientific effects of music. Practicing music therapists are reporting significant results when music is used with neurologically and physically impaired patients.

Scientists and academicians at over 18 universities and clinical sites in the U.S. and Canada are currently involved in music and brain function research. These investigators, along with leading clinicians, maintain that if specific responses to music can be mapped and then linked to what is needed by patients to accelerate their healing, we will find new ways to apply music prescriptively to hasten recovery. Such research has enormous possibilities for millions of impaired people throughout the world.

Brain function of the experience of music is being studied by basic science researchers using imaging equipment: MRI, fMRI, MEG, SQUIDS, PET and the Electroencephalogram (EEG). Emotional responses to music are studied with psychological tests and physiologic measures: blood pressure, hormone level, skin response, respiration rate, and electromyograms (EMG). Other clinical researchers of music and brain function have used cognitive/behavior scales and included case studies, and qualitative and quantitative methodology.

Science has not found a specific "music center" in the brain because the ways in which the brain processes music is complex. We do know that music affects our neurological, psychological and physical functioning in such areas as learning, language processing, emotional expression, memory, physiological and motor responses.

The left brain is involved with general music ability in musicians, perception and production of speech, perception of rhythm and parosody, lyric performance during singing, and the temporal sequences of reading ability. The right brain is involved with processing of musical pitch, control of sound intensity, identification of musical chords, melody perception in non-musicians, visual pattern recognition, singing, auditory pattern recognition, and expressive rhythmic and melodic behavior.

New studies are reporting overlapping areas for music and language processing. Rhythm has been found to positively influence brain activity during learning; scientists have reported that after a rhythm sequence is

stopped, brain activity occurs in anticipation. Some believe that music-based communication may be possible even when language processing is missing.

Low-frequency vibration and physioacoustic techniques have clearly shown to have some positive neuromuscular effect in managing spasticity. Research using physioacoustic techniques is ongoing.

The future of music brain research is bright. Additional study is needed:

- to specify the effect of each of the components of music (i.e., rhythm) on specific areas of brain activity,
- to specify areas of brain activity during emotional responses to music,
- to analyze the structural similarities between music and language,
- to study the neuromuscular effect of low-frequency vibration and music,
- and to study the effect of music on retrieval in short and long term memory.

Neuroscientists are continuing to map brain function in relation to music using new brain imaging technology. They are also combining neuro-imaging methods such as fMRI and MEG to produce more complete and detailed images and measurement of brain function.

As new research is supported to explore the specific neurological effects of music in its uses for neurological and physical healing, we hope to see the development of wellness models of music therapy that may be applied to the population at large.

Of paramount importance in the growth of music as a viable healing tool is growing communication that links basic science/neuroscience and music therapy clinicians so research needs and research findings can be shared and developed into effective practice.

The Institute for Music and Neurologic Function is working to advance this research and its clinical applications as part of an emerging scientific effort to draw on music's powers to help retrieve lost and compromised function. We are striving to help develop and share these findings and applications within the scientific community and the world at large.

The Institute advances research collaborations with outstanding investigative scientists and biomedical researchers, and in clinical research with physicians, music therapists, musicians and other professionals.

There are a number of studies currently underway including three major projects:

- Music Therapy and Stroke Rehabilitation
- The Effects of Low Frequency Sound on Spasticity and Pain Management
- Use of Music Therapy in Enhancement of Motor Function.

By applying the research findings, the Institute seeks to expand the range of therapeutic modalities in the treatment of patients with many debilitating disorders. As part of a major metropolitan health care facility with a long history of treating neurological disorders, Institute personnel are dedicated to helping patients and residents restore lost function in the areas of music and language, memory, learning and recovery from nerve injury.

The major areas of work include understanding and explicating the following connections:

Music and Language

Music has the power to help patients with language disorders regain some speech.

Understanding how the brain processes music has given researchers significant insight into the processing of other complex auditory stimuli, such as language. This knowledge has aided children with language disorders and patients who have lost their use of language as a result of stroke or head trauma.

Music and Memory

Music has the power to stimulate memory in patients with dementia

Researchers are studying how music appears to animate and organize brain activity and has the potential to communicate with someone who is unresponsive to the usual conduit of speech. Notable success has been achieved with patients suffering with amnesia, memory problems and all types of dementia including short- and long-term memory responses, decreased agitation and enhanced reality orientation.

Music and Learning

Music has the power to promote and enhance information storage and learning.

Studies are being conducted to identify those times during child's development (known as "critical development windows") when music may promote or enhance learning and retention. This information may be extremely useful in education.

Music and Recovery from Nerve Injury

Music has the power to recover movement in patients with neurodegenerative conditions.

Research in this area will determine whether, after neural damage, music can be used to:

1. promote the activation of existing neural connections
2. establish alternate nerve pathways that can be used to re-establish behaviors, and/or
3. facilitate reorganization of structure and function in the mature brain. The effects of music on the recovery of movement, especially the recovery of walking and dancing are being examined.