



Singing Your Way to Neurology

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Abstract

Introduction

Researchers worldwide are utilizing the therapeutic and healing properties of music for treatment and rehabilitation of patients with medical illnesses. In recent times, it is increasingly being used for neurological diseases, as well. Hence, we reviewed the effects of music on people with neurological diseases and its therapeutic potential.

Methods

We did a PubMed search for the terms “Music and Medicine”, “Music and Neurological Diseases” and selected the relevant studies and then compiled the results of these studies to get an insight into the therapeutic potential of music for patients suffering from various neurological ailments.

Results

Music may help in relieving medical and surgical pain. It may help people with dementia, movement disorders, epilepsy, multiple sclerosis, traumatic brain injury, fibromyalgia, anxiety, depression and other psychiatric illnesses and those with less arousal states. Children with developmental and acquired deficits, those in pain and those undergoing electrodiagnostic

procedures may all benefit by music. Treatment employing music may have hormonal, neurotransmitter-related and neurostimulatory effects and may alter neuroplasticity.

Conclusion

Music may be beneficial in Neurology and more research may yield more information about the its mechanism of action on human brain.

Introduction

Since times immemorial, music continues to be a part and parcel of daily life of human beings as well as some animals like singing birds and the fossil studies show the oldest records of musical instruments from France (around 18000 years before present), Germany (43,150-39,370 years before present) and from Slovenia (belonging to Neanderthals) [1]. Hence, the exact singing and musical ability of humans as we know it today has evolved gradually over time and there are genetic and environmental theories to account for the same. We now know that music training upregulates the target genes of FOXP2 (forkhead box protein P2), the alpha-synuclein gene (SNCA) and also microRNAs. On the other hand, music switches off the genes targeted by transcription regulators for proinflammatory cytokines and those for the apoptosis of the nerve cells [1]. Even studies show an aptitude for music among twins.

Music and Medicine

Due to its pleasant and healing effects, music may treat patients with medical illness [2]. Previously, the scholars have defined music therapy as the “systematic use of music within a therapeutic relationship which aims at restoring, maintaining and furthering emotional, physical and mental health” [3]. Premature infants, patients with cardiac diseases, neurological diseases, gastrointestinal diseases, respiratory illnesses, metabolic issues, psychiatric disorders, chronic cancer pain, surgical procedures, radiological procedures, dental procedures, anesthesia

services and palliative care services may all utilize music as a form of treatment [3-14].

Music and Neurological Diseases

Not infrequently, oncologists may call a neurologist to manage pain and listening to music may help in managing chemotherapy related pain [15] and medical or surgical procedure related pain [16,17].

According to previous literature, music intervention may improve spatial skills of people with dementia and otherwise also help these individuals [18,19]. Apart from its beneficial effects on individuals with stroke and dementia, music therapy, including singing, dancing and instrumental music may improve cognition, attention, memory, motor function, gait, speech and emotional state of people with Alzheimer’s disease, Parkinson’s disease and other movement disorders like Huntington disease, Tourette syndrome and progressive supranuclear palsy, epilepsy and multiple sclerosis [20-22]. According to a study on patients with Parkinson’s disease, group-based music intervention helped in mood, alertness, and improving overall quality of life but did not help in dual-tasking, cognition, balance, or freezing of gait in these individuals [23].

A randomized control trial found it to be no better than conventional physiotherapy for motor recovery of the upper limb function following stroke [24]. Nevertheless, it may improve speech in severe non fluent aphasia [25] and may induce muscle relaxation in patients having hypertonia [26].

In a previous research article, investigators did not find a significant decrease in pain and anxiety after listening to music while undergoing electromyography [27] and listening to music at bedtime before sleeping may increase symptoms of restless legs syndrome due to disruption in sleep [28]. Nevertheless, music helps in post-stroke depression [29].

Studying traumatic brain injury patients, the previous researchers are of the opinion that gray matter volume increases significantly in the right inferior frontal gyrus following music treatment [30].

The doctors are also trying music treatment in patients in low awareness states [31].

For those who are on mechanical ventilation also one may use various genres of music, for example classical, jazz, rock, country, oldies and utilize instruments like piano, voice, guitar, music with nature sounds, and orchestral music for managing anxiety and pain [32,33]. There are, however, some trials, which refute these observations [34]. Singing and playing wind instruments may help in improving the respiratory function of people with chronic neurological diseases [35]. Functional disorders as well as pain in fibromyalgia may, however, benefit by music [36,37].

Music and Children in Neurology

For electrodiagnostic studies in children, music may be comparable to medical sedation [38].

By enhancing temporal processing and rhythm abilities, music intervention may improve phonological awareness and reading skills in dyslexia [39]. It may reduce tics in Tourette's syndrome, benefit in autism spectrum disorder, Rett syndrome, children with disabilities, hypertonia, epilepsy, mental health, neonatal care, neurorehabilitation, and help reduce pain and anxiety levels in medical procedures, in pediatric oncology and in palliative care [40-42].

Even during fetal stage, different aspects of music like timing, timbre, repertoire and entrainment may play a crucial role in affecting and shaping the neuroplasticity [43].

How Music Influences the Brain?

Music may alter the neural systems for reward, arousal, affect regulation, learning and activity-driven neuroplasticity in human brains [20]. Additionally, the functional MRI studies prove the remodeling of motor and auditory cortex in professional musicians.

Neurotransmitter and hormonal changes take place with music. Furthermore, Mozart's music improves neuropsychological activity leading to "The Mozart Effect" [44] and the researchers are utilizing this "Mozart Effect" (Mozart's sonata for two pianos in D major, K448) to not only reduce the frequency of seizures in epilepsy but also in children with drug refractory epileptic encephalopathies [45]. According to a study on neonates in the intensive care unit, listening to music affected the functional connectivity on scalp electroencephalography [46] and another study employing Indian classical music affected EEG waves of patients with traumatic brain injury [47].

An interesting aspect of music is that during olden days, there was a class of people who believed that music may even be pathological due its neurostimulatory effects, though the so-called effects may have been psychosomatic or related to the existing sociocultural norms rather than physiological [48]. This reminds us of the fact that music training may be counterproductive as is the case of 'musician's dystonia' [49] or 'musicogenic epilepsy' [50].

Conclusion

Last but not the least, teaching music to the doctors may help in fostering humanism in medicine [51]

and hence, there is a growing need for imparting a music cognition research training to the neurologists in particular [52].

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