



Implications of music in modern medicine

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Received: 13-MAY-2021

Accepted: 11-JUL-2021

Published: 06-SEP-2021

Abstract

Though rarely a stand-alone treatment, music's ability as an adjunct to standard treatment in increasing the quality of life has been acknowledged for decades. At first glance, the role of music in medicine may seem amorphous; however, with advancements in science, our understanding of the physiology and neurochemistry of music in relation to the human brain has expanded. Listening to and playing music involves an intriguing combination of virtually every human cognitive function. Music's inherent ability to evoke emotions is the rationale behind music-induced goose-bumps and 'chills of euphoria'. The psycho-neuro-endocrinology of music is a fascinating and growing field of research. In the last decade, there has been burgeoning clinical evidence on the measurable effects of music therapy over a broad spectrum of medical specialties including neurology, cardiology, psychiatry, and palliative oncology. Perhaps it is time for physicians to consider an evidence-based musical intervention as routine adjunctive therapy.

Keywords: Adjunctive therapy; Burnout; Health humanities; Music; Music therapy.

Introduction

Studies exploring the physiology behind piloerections conclude that the phenomenon may be beneficial in gauging the pinnacle of one's emotional arousal.[1] Also known as goosebumps in common parlance, how does music evoke these emotions? The beginning of the 20th century saw critical advances in learning the neural correlates of music. Researches using functional neuroimaging on music and emotion reveal that the structures of the brain that are vital in emotions (amygdala, hypothalamus, insula, nucleus

accumbens, hippocampus, cingulate cortex, and orbitofrontal cortex) are the same parts that are modulated by music.[1]

Music as therapy: the science behind it

Disorders such as depression and pathologic anxiety are related to amygdalar dysfunction, which explains the rationale behind why musical interventions are helpful in their management.[2] This also accounts for the use of musical interventions among Alzheimer's patients with anxiety and

Cite this article as: Rajendran T. Implications of music in modern medicine. RHIME. 2021;8:98-102.

depression.[3] In 2001, Blood et al. studied the brains of musicians who experienced 'chills of euphoria' while listening to music; they observed that a few of the same reward systems were activated by music as were stimulated by addictive drugs, food, and sex. This is another lead to how music elicits joy. [4] I was giving a virtual lecture-concert on the importance of music in oncology for doctors and cancer patients and survivors as part of world cancer day 2021. I warmly recollect how, after the concert, a patient in remission mentioned: "I had a rough day today. When I visited my oncologist, he said he saw something in the imaging that did not look so well. I was stressed all day, but I feel calm after listening to your music. Thank you!"

Remarkably, emotions are intimately associated with peripheral physiology - they affect the autonomic nervous system. While some emotional states raise our heart rate, others calm us down. The clinical use of live sound and parent-preferred lullabies applied by a board-certified music therapist has been shown to reduce heart rate and respiratory rate, and increase sucking behavior in premature babies.[5] The interventions used were evocative of the mother's heartbeat (using a wooden Gato box), and the gushing timbre of amniotic fluid (using an Ocean Disc which evokes a womb-like whooshing sound). In the middle of the monitoring equipment's constant beeping inside the neonatal intensive care units, these simple interventions provide an 'in-utero' sense that calms the babies. I was astounded to witness this while I was an international visiting neonatology sub-intern at the Mount Sinai Hospital in New York.

The effect of sound/music on the autonomic nervous system is further utilized to extend comfort to patients undergoing surgery by reducing the heart rate and blood pressure. [6,7] It's also used in heart attack and stroke rehabilitation.[8,9] Randomized controlled trials suggest listening to vocal music is a successful intervention to support cognitive

recovery following stroke. Listening to vocal music is additionally shown to enhance early language recovery in aphasia. This outcome may be driven by both functional and structural plasticity alterations in temporo-parietal networks imperative for language, emotional processing, and memory.[10]

Interestingly, emotions are inter-twined with endocrinology as well. β -endorphin and cortisol are two markers of the hypothalamic-pituitary-adrenal (HPA) axis, and they were found to decline with music interventions.[11] Exciting music raised plasma cortisol, ACTH, prolactin, growth hormone, and norepinephrine levels, and listening to music postoperatively, lowered serum cortisol.[12] This underlines the fact that the outcomes of musical interventions are subjective and are heavily influenced by memory and mood. Neurochemistry of music is a fascinating avenue to explore further.

A meta analyses that reviewed ten randomized controlled trials provide evidence that musical interventions may improve verbal and non-verbal communication, social interaction, initiating behavior, and social-emotional reciprocity in children with autistic spectrum disorders.[13] Additionally, musical interventions might contribute to enhancing social adaptation skills. Further-more, it also improves parent-child bond.[13] Rhythm-based interventions may propose a spectrum of symptom alleviation to patients with Parkinson's disease.[14] Listening to Mozart K-448 reduced the frequency of epileptiform discharges in children with refractory epilepsy. [15] Musical interventions also reduced pain in adult surgical patients.[16]

Music for its own sake

Physician burnout had already attained epidemic status worldwide in the pre-covid pandemic era, and has only become worse thereafter.[17] This mental health issue is under-recognized in lower-middle-income countries, including India.[18] Most people do not consider that physicians can also get exhausted. Amelioration requires an



Figure: The author and her Veena

Source: Image captured at the 27th International Conference of the Indian Association of Palliative Care, 'Music Therapy in Palliative Care'.

institutional level approach and not only at an individual level. Resorting to a favorite creative expression that one finds the most cathartic would greatly help in reducing stress and anxiety.[19] Art helps express oneself. Particularly in these precarious times, identifying ones own creative outlet and practicing the art for a couple of times in a week might help lower the emotional exhaustion.[20-21] After a night shift, I returned to my hostel room and crawled in like a fetus on the floor, succumbing to severe physician burnout. My scrubs had splashes of amniotic fluid, blood streaks, urine, and even a tinge of feces from the night's labor room rotation. I let my fingertips tryst with the seven strings for 15 minutes, and I slowly witnessed music lifting me out of the unfathomable, suffocative pain! The figure above shows my favorite way to unwind - strumming my Veena.

Music is a primitive and inherent trait of our species. Prehistoric people, over 30,000

years ago, were already playing jaw harps and vulture bone flutes. Every civilization that ever existed has appreciated music's therapeutic potential. Modern homo-sapiens are standing on the shoulders of scientific evidence and advancements. In the last few decades, we have been able to measure the medical benefits of music. This might be the time for physicians to provide evidence-based musical interventions as adjunctive therapies through a board-certified music therapist to their patients.

"The inexpressible depth of music, so easy to understand and yet so inexplicable, is due to the fact that it reproduces all the emotions of our innermost being, but entirely without reality and remote from its pain...Music expresses only the quintessence of life and of its events, never these themselves."

- Arthur Schopenhauer
(as quoted by Oliver Sacks in Musicophilia:
Tales of Music and the Brain)

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