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The Healing 'Touch' of Music: A Neuro-Acoustics Approach to Understand Its Therapeutic Effect

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Abstract : Music can heal the body, but a mechanistic understanding of this phenomenon is lacking. This study explores the effects of music presentation on neurologic and physiologic responses leading to metabolic changes in the human body. The mind and body co-exist in a corporeal entity and within this framework, sickness ensues when the mind-body balance goes awry. It is further hypothesized that music has the capacity to directly reset this balance. Two lines of inquiry taken together can provide a mechanistic understanding of this phenomenon 1) Empirical evidence for a sound-sensitive pressure sensor system in the body, and 2) The notion of a “healing center” within the brain that is activated by specific patterns of sounds. From an acoustics perspective, music is spatially distributed as pressure waves ranging from a few cm to several meters in wavelength. These waves interact and propagate in three-dimensions in unique ways, depending on the wavelength. Furthermore, music creates dynamically changing wave-fronts. Frequencies between 200 Hz and 1 kHz generate wavelengths that range from 5'6" to 1 foot. These dimensions are in the range of the body size of most people making it plausible that these pressure waves can geometrically interact with the body surface and create distinct patterns of pressure stimulation across the skin surface. For humans, short wavelength, high frequency (> 200 Hz) sounds are best received via cochlear receptors. For low frequency (< 200 Hz), long wavelength sound vibrations, however, the whole body may act as an ideal receiver. A vast array of highly sensitive pressure receptors (Pacinian corpuscles) is present just beneath the skin surface, as well as in the tendons, bones, several organs in the abdomen, and the sexual organs. Per the available empirical evidence, these receptors contribute to music perception by allowing the whole body to function as a sound receiver, and knowledge of how they function is essential to fully understanding the therapeutic effect of music. Neuroscientific studies have established that music stimulates the limbic system that can trigger states of anxiety, arousal, fear, and other emotions. These emotional states of brain activity play a crucial role in filtering top-down feedback from thoughts and bottom-up sensory inputs to the autonomic system, which automatically regulates bodily functions. Music likely exerts its pleasurable and healing effects by enhancing functional and effective connectivity and feedback mechanisms between brain regions that mediate reward, autonomic, and cognitive processing. Stimulation of pressure receptors under the skin by low-frequency music-induced sensations can activate multiple centers in the brain, including the amygdala, the cingulate cortex, and nucleus accumbens. Melodies in music in the low (< 600 Hz) frequency range may augment auditory inputs after convergence of the pressure-sensitive inputs from the vagus nerve onto emotive processing regions within the limbic system. The integration of music-generated auditory and somato-visceral inputs may lead to a synergistic input to the brain that promotes healing. Thus, music can literally heal humans through “touch” as it energizes the brain’s autonomic system for restoring homeostasis.

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