

## Music as Medicine



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Music is a fundamental attribute of the human species. Virtually all cultures, from the most primitive to the most advanced, make music. It's been true through history, and it's true throughout an individual's lifespan. In tune or not, we humans sing and hum; in time or not, we clap and sway; in step or not, we dance and bounce.

The human brain is hardwired to distinguish music from noise and to respond to rhythm and repetition, tones, and tunes. The auditory nerve transmits the electrical signals of music and other sounds to the auditory cortex in the temporal lobe. Studies using magnetic resonance imaging and positron emission tomography scans suggest that nerve networks in different parts of the brain bear primary responsibility for decoding and interpreting different properties of music.<sup>1</sup> For example, a small area in the right temporal lobe is essential to perceive *pitch*, which forms the basis of *melody* (patterns of pitch over time), *chords* (multiple pitches that sound at the same time), and *harmony* (2 or more melodies at the same time). Another nearby center is responsible for decoding *timbre*, the quality that allows the brain to distinguish between different instruments that are playing the same note. The cerebellum processes rhythm, and the frontal lobes interpret the emotional content of music. And music that's powerful enough to be "spine tingling" can light up the brain's reward center, much like pleasurable stimuli ranging from alcohol to chocolate.

Although every healthy human brain can perform all the complex tasks needed to perceive music, musicians' brains are, so to speak, more finely attuned to these tasks.<sup>2</sup> Physicians, too, may have a particular affinity for music. Notable physician-musicians include Hector Berlioz, Fritz Kreisler, Aleksandr Borodin, Theodor Billroth, Albert Schweitzer,<sup>3</sup> and Jeffrey Tate. Classical orchestras

composed of doctors and medical students perform regularly in Boston, Los Angeles, Philadelphia, and Houston.<sup>4</sup> Many surgeons play music in their operating rooms to enhance concentration and focus, and many practitioners rely on music for relaxation, stimulation, and pleasure.

Music is important for many physicians—but can doctors use music to promote the health and well-being of their patients? A variety of studies suggest the answer may be yes. Some are blinded, randomized trials, but most are relatively small and brief. Still, they present an interesting group of observations.

### NEUROLOGIC FUNCTION

The most highly publicized influence of music on the brain is the so-called Mozart effect. A 1995 report found that listening to Mozart improved performance on IQ tests.<sup>5</sup> Unfortunately, subsequent research found that the purported benefit was minimal and short-lived.<sup>6</sup> Still, learning to play music in childhood enhances neuroplasticity, resulting in certain structural changes and functional improvements that persist into adulthood.<sup>7-9</sup> Playing music is more complex and demanding than simply listening, but listening may enhance cognitive function in the elderly<sup>10,11</sup> and improve quality of life and possibly cognition in dementia.<sup>12</sup> Music listening can assist cognitive recovery, elevate mood,<sup>13</sup> and boost muscular function<sup>14</sup> after certain strokes. Singing has been used to help aphasic patients recover speech.<sup>15</sup> Music-based training can improve gait and balance in elderly people at risk for falling<sup>16</sup>; brisk, rhythmic music enhances gait velocity, cadence, and stride length in patients with Parkinson's disease.<sup>17</sup>

### STRESS, SEDATION, AND ANALGESIA

Music allows people to express their feelings and communicate with others. More than simply expressing emotions, music can alter them; indeed, Tolstoy said that music is the shorthand of emotion, and Congreve explained that music has charms to soothe a savage breast.

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Few things are more stressful than illness and surgery. Music can reduce stress in these circumstances. Listening to music during cataract surgery reduces intraoperative and postoperative blood pressures and heart rates.<sup>18</sup> Music also reduces sedative requirements in patients undergoing urologic procedures under spinal anesthesia<sup>19</sup> and in intensive care unit patients.<sup>20,21</sup> Reduced levels of interleukin-6 and epinephrine may account for this benefit, as well as the lower blood pressures and heart rates associated with some types of music.<sup>21</sup>

## CARDIOVASCULAR REACTIVITY

The body's response to music is influenced by the type of music used. Rapid, march-like rhythms improve the gait of patients with Parkinson's disease.<sup>17</sup> Tempos that are slow, relaxing, or joyful appear to reduce blood pressure and heart rate and promote vasodilatation, whereas fast, tension-producing music has the opposite effect.<sup>21-25</sup> These changes are short-lived, but daily sessions of music-guided slow breathing may produce a sustained reduction in blood pressure not seen with music alone.<sup>26</sup>

## MOOD AND QUALITY OF LIFE

Plato believed that music gives soul to the universe, wings to the imagination, and charm and gaiety to life. Gaiety may be beyond the reach of patients with depression, cancer, chronic pain, and terminal illnesses, but music therapy has been able to improve mood and quality of life in these circumstances.<sup>27-32</sup> Additional research is needed to confirm these apparent benefits and elucidate their mechanisms, but Browning may have provided a clue when he observed that a person who hears music feels his solitude peopled all at once.

## THE SCIENCE OF ART

The ancient Greeks put one god, Apollo, in charge of both medicine and music. Contemporary scientists tell us that music can enhance the function of neural networks, slow the heart rate, lower blood pressure, reduce levels of stress hormones and inflammatory cytokines, and provide some relief to patients undergoing surgery and to those with Parkinson's disease, strokes, heart attacks, depression, and painful chronic illnesses. Arnold Steinhardt, the founding first violinist of the Guarneri String Quartet, said that there seems to be a mysterious and powerful underground railroad linking medicine and music. He wondered if perhaps music is an equally effective agent of healing, and doctors and musicians are part of a larger order serving the needs of mankind.

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