

## Music of the Heart

Grace Sun

The concert hall is silent and tense. A sudden sparkle draws the audience's attention: the conductor's silver baton as it rises. Like a shining herald, it comes down, causing a storming convergence of strings, percussion, and woodwinds to transform into the four ominous notes of Beethoven's 5th Symphony. Symphony No. 5 marks the subtle nonuniformities in the tempo as it progresses, confusing every listener's inner metronome. This bold style and inconsistent tempo is typical of Beethoven's introductions which is perhaps inspired by his arrhythmia, or irregular heartbeat.

Arrhythmia, classified as "very common" with more than 3 million cases worldwide, is a cardiovascular phenomenon that ranges from an occasional skip to a chronic irregularity in heartbeat. Usually, a steady pattern of electrical zaps instructs the heart's muscle cells to contract. Elizabeth Eaton, a writer from *Science News for Students*, explains that "this creates their rhythmic pattern, known as the heartbeat. These contractions pump blood through the heart and throughout the rest of the body."<sup>1</sup> While people's electrical zaps normally create a predictable heartbeat that dictates the score of daily life, sometimes this can be disrupted by outside factors, causing discomfort and anxiety.

An innovative diagnostic tool, however, is breaking the boundaries between health and music, creating a completely unexpected medley. By utilizing the shifting musical rhythms as a kind of musical heartbeat visualizer to replace the original paper heartbeat diagram, erratic music such as Symphony No. 5 may present a new hope of diagnosing arrhythmia earlier. A trial from the Centre of Digital Music (CDM) analyzes arrhythmic beat patterns by turning recorded heartbeats into classical music, much like Beethoven's Symphony. By translating electrocardiogram measurements to music notation, doctors and musicians collaborate to create new medical music compositions. Orchestras can then play these concertos, creating beautiful melodies with a pulse hidden in the meter. Doctors can listen to these varying rhythms, making arrhythmia easier for them to detect. Dr. Elaine Chew from the CDM adds that "deep-diving into the temporal structure of the electrocardiogram – rather than current methods," inherently 'hearing' the arrhythmia rather than seeing it on a flat page "reveals complexities hidden in frequency-based approaches."<sup>2</sup> In other words, the richer detail afforded by melodic representations of arrhythmia has the potential to enable doctors to target personalized treatments. By identifying patients at different stages of the disease through sound, they can decide if drugs or a cardiac procedure is better.

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<sup>1</sup> Eaton, Elizabeth. "Steady Heartbeats May Depend on White Blood Cells." *Science News for Students*, 5 May 2017.

<sup>2</sup> McPherson, Angus. "Music Made from Heartbeats May Aid Arrhythmia Diagnosis." *Limelight Magazine*, 20 Sept. 2017.

Arrhythmic music might even present a viable cure, separate from diagnosis.<sup>3</sup> When played back to the patient, certain remedial music with hidden calming beats may regulate the heartbeat, a much simpler solution than we have ever had before. Capturing the tones of arrhythmia through musical notation might just prove music is indeed medicine. In contrast to the 5th Symphony's jarring notes and drawn-out pauses in the midst of harmony, concertos for the core, as well as hundreds of new compositions, hold limitless potential for a solution to a health issue, truly the music of the heart.

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<sup>3</sup> "Using Music to Tune the Heart." *Harvard Health Publishing*, 26 Aug. 2019.