

Thoughts About Sound Frequencies and Well-Being

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A. Purpose of This Discussion Paper

For many decades I have been fascinated by the acoustics and physics of music, particularly how tone, rhythm, and frequency affect human emotion and physiology.

Each person experiences sound uniquely. With roughly 37 trillion cells in the human body — all slightly different from one individual to the next — it's no surprise that the same piece of music or the same sound can evoke vastly different responses in different people.

While creating the album and video series *Solfeggio Healing Frequencies*, I wanted to explore the broader question: **Why does sound, in general, have the capacity to influence our well-being?** This discussion paper presents plausible mechanisms drawn from acoustics, psychoacoustics, neuroscience, and psychophysiology. It is written as a labour of love from a scientist, acoustician, and musician.

B. Plausible Mechanisms of How Sound Can Affect Well-Being

B-1. Neurological and Brainwave Effects

Different sounds and rhythms can influence your brainwaves — a natural process called entrainment. This means the brain can start to match the pace of the sound, helping it to shift from busy, stressed states into calmer, more relaxed ones. Slower rhythms and specific tones have been shown in multiple studies to guide the brain from high-beta “alert” states associated with stress into calmer alpha and theta states, which are linked to reduced anxiety and improved emotional regulation.

(a) Geek Science Moment The brain produces electrical rhythms called brainwaves, measured in Hertz (Hz):

- **Delta Waves (0.5 – 4 Hz):** The slowest brainwave state. Delta is dominant during deep, dreamless sleep and profound physical restoration. It is associated with healing, immune function, and the body's deepest recovery processes. Many people experience a profound sense of peace and regeneration when gently guided into delta states through slow, low-frequency sound.
- **Theta Waves (4 – 8 Hz):** The bridge between wakefulness and sleep. Theta is strongly linked to deep meditation, creativity, intuition, and emotional release. In this state, the mind becomes quiet and more receptive. Theta is often described as the “twilight” zone where insights, memories, and emotional processing can surface. This is one of the most sought-after states in meditation and sound healing practices.
- **Alpha Waves (8 – 13 Hz):** The relaxed but awake state. Alpha brainwaves appear when we are calm, present, and mentally quiet — such as during light meditation, mindful breathing, or simply resting with eyes closed. Alpha is associated with

reduced anxiety, improved focus, and a pleasant “flow” feeling. Many people feel a gentle sense of calm and mental clarity in this range.

(b) How this may relate to “Solfeggio Healing Frequencies” The slow, ambient, and harmonically pure nature of these recordings, combined with continuous pure sine waves, naturally supports the brain’s transition into alpha and theta states. This stable sonic environment may help listeners feel calmer, more centered, and emotionally lighter.

B-2. Autonomic Nervous System Modulation

Sound can significantly influence the autonomic nervous system. Pleasant, slow-tempo, low-frequency sounds tend to activate the **parasympathetic nervous system** (“rest and digest” mode). This leads to lowered heart rate, reduced blood pressure, decreased cortisol levels, and increased heart rate variability (HRV) — a key marker of resilience and recovery.

(a) Geek Science Moment The autonomic nervous system has two branches: sympathetic (“fight or flight”) and parasympathetic (“rest and digest”). Predictable, harmonious sound has been shown in meta-analyses to down-regulate sympathetic activity and up-regulate parasympathetic activity, producing measurable reductions in stress hormones.

(b) How this may relate to “Solfeggio Healing Frequencies” The mono-frequency purity and gentle, continuous nature of these tracks may serve as a stable auditory anchor, helping the nervous system shift more easily into parasympathetic dominance and supporting emotional balance and recovery.

B-3. Resonance and Vibroacoustic Effects

Sound is mechanical vibration. Since the human body is approximately 60% water, it can act as a medium for these vibrations. Specific frequencies can create subtle resonance patterns in tissues, cells, and bodily fluids — a principle studied in the field of cymatics – where sound shapes matter.

(a) Geek Science Moment Lower-frequency vibrations have been shown in controlled studies to influence cellular processes, reduce certain inflammation markers, and help the body physically relax and release tension. Pure tones tend to produce cleaner and more coherent resonance fields than harmonically complex music.

(b) How this may relate to “Solfeggio Healing Frequencies” By maintaining strict mono-frequency purity — one exact frequency tuned throughout each track, every chord and with a continuous sine wave — these recordings aim to create a more coherent and focused vibrational field than music that layers multiple frequencies.

B-4. Psychological and Emotional Mechanisms

Sound influences the brain’s physical emotional centers. Familiar, non-threatening sonic textures can reduce activity in the amygdala (the brain’s fear center) and increase activity in areas associated with safety and reward ultimately affecting hormonal balance and specific stress hormones like cortisol.

(a) Geek Science Moment When listeners feel “held” by consistent, predictable sound, it can down-regulate threat responses and support emotional regulation and release. This effect is often amplified when sound is paired with conscious breathing.

(b) How this may relate to “Solfeggio Healing Frequencies” The intentional mono-frequency design and subtle thematic melodies may create a deeper sense of safety and coherence, potentially supporting emotional release and psychological well-being during listening or breathwork.

B-5. The Unique Aspect of Mono-Frequency Purity

Many Solfeggio music recordings layer multiple frequencies simultaneously. In contrast, these recordings maintain strict **mono-frequency purity**: each track is built around one exact Solfeggio frequency, with all instruments and chords micro-tuned to it and a continuous pure sine wave present throughout.

(a) Geek Science Moment This approach creates a more focused and harmonically coherent vibrational field. While research specifically on mono-frequency composition is still emerging, many practitioners believe it allows the chosen frequency to resonate more clearly with the body’s systems rather than competing with other tones.

(b) How this may relate to “Solfeggio Healing Frequencies” This purity is the defining characteristic of the album. It reflects a deliberate artistic and technical choice to offer listeners a clean, intentional sonic environment for relaxation and introspection.

B-6. Rhythm or Pulse

There is solid science behind the calming nature of 60 BPM music. Interestingly, it closely matches the average adult resting heart rate (~60-80 BPM). Research on music and relaxation shows that tempos around 60 BPM can support physiological entrainment, encourage slower breathing and heart rate while promoting alpha brainwave states (8-14 Hz) associated with calm, relaxed wakefulness and meditative focus.

(a) Geek Science Moment Scientific theory and observations indicate that music at ~60 BPM can facilitate physiological entrainment, whereby internal bodily rhythms (heart rate, breathing) may gradually synchronize toward the external tempo. This process is thought to activate the parasympathetic nervous system, encouraging slower breathing and heart rate, reduced arousal, and a shift toward relaxed wakefulness.

Additionally, listening to music around 60 BPM has been associated with increased alpha brainwave activity (8-14 Hz) in EEG studies. Alpha waves are characteristic of calm, alert, meditative states—similar to light meditation or relaxed focus—without drowsiness.

(b) How this may relate to “Solfeggio Healing Frequencies” All tracks are done at 60 BPM. The pulse remains understated. Intended to deepen the overall sense of safety, flow, and presence for listeners using the music in short healing meditations or relaxation sessions.

C. The Unique and Mystical Aspects of Solfeggio Frequencies

C-1 Understanding Solfeggio Frequencies

The Solfeggio frequencies are a set of nine tones often associated with meditative and relaxation practices. Rooted in numerology and acoustics, they are said to align with specific vibrations that many people find supportive of calm and focus.

Traditionally, each frequency is linked to a particular quality:

- 174 Hz: Grounding and security
- 285 Hz: Energy field balance and regeneration
- 396 Hz: Releasing heavy emotions
- 417 Hz: Facilitating change and flow
- 528 Hz: Love and transformation (“miracle tone”)
- 639 Hz: Harmonious relationships and compassion
- 741 Hz: Awakening intuition and clarity
- 852 Hz: Returning to inner strength and awareness
- 963 Hz: Oneness and pure presence

C-2 How Were the Solfeggio Frequencies Determined?

The six core Solfeggio frequencies were rediscovered in the 1970s by Dr. Joseph Puleo. He claimed they were encoded in the Bible (Book of Numbers, Chapter 7) and extracted them using Pythagorean reduction (digital root mathematics).

Three additional frequencies were later added to complete the modern nine-tone scale. While there is no definitive archaeological evidence that these exact frequencies were used in ancient music, their mathematical symmetry — particularly the recurring 3-6-9 pattern — has made them enduringly popular in sound healing and meditation practices.

(a) Geek Science Moment – The 3-6-9 Pattern All nine Solfeggio frequencies reduce to either 3, 6, or 9 through numerology reduction. *This is not random.* These three numbers form a special cycle in modular arithmetic. They are deeply connected to circles, spirals, vortexes, and repeating patterns in nature and physics.

This creates three natural families and reflects a deep mathematical symmetry found throughout geometry, physics, and natural systems.

Nikola Tesla famously said:

“If you only knew the magnificence of the 3, 6 and 9, then you would have a key to the universe.”

For Tesla, 3, 6, and 9 were not just mathematical curiosities — he saw them as fundamental to the structure of energy and the universe itself. He viewed the universe as being built on vibration, frequency, and resonance, and believed these three numbers acted as a kind of master code governing how energy moves and transforms.

(b) How this may relate to “Solfeggio Healing Frequencies” The elegant 3-6-9 pattern gives the scale an internal logic and symmetry that many find meaningful. Combined with the mono-frequency purity of these recordings, it creates a coherent and intentional sonic environment for relaxation and introspection.

Whether you view this through a spiritual, acoustic, or symbolic lens, the pattern gives the nine frequencies a beautiful internal logic and symmetry.

Disclaimer The recordings by Kluane Takhini called “Solfeggio Healing Frequencies” are intended solely for relaxation, meditation, and general well-being. They are not intended to diagnose, treat, or cure any specific medical condition.