

**BRIEF REPORT**

# Evaluating the Effects of Pure Tone Solfeggio Frequencies on Skin Conductivity

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## ABSTRACT

This study investigates the impact of Solfeggio frequencies on skin conductivity, a measure linked to autonomic nervous system arousal. Through controlled exposure, participants were assessed for changes in skin conductivity in response to six specific frequencies, including 528 Hz, which are hypothesized to promote healing and overall well-being. Findings indicate that 741 Hz and 852 Hz increase skin conductivity, potentially validating their use in therapeutic applications.

## KEYWORDS

Biophysics, skin conductivity, holistic wellness, solfeggio frequencies, sound healing, integrative research.

## INTRODUCTION

Solfeggio frequencies are specific sound frequencies believed to promote healing and balance in the body. The six primary frequencies—396 Hz, 417 Hz, 528 Hz, 639 Hz, 741 Hz, and 852 Hz—are thought to resonate with the body's natural rhythms, influencing emotional and physical well-being. 528 Hz has been shown to reduce stress, but scientific evidence on the other five frequencies is scarce (Akimoto et al., 2018). The skin, as a sensory interface, responds to physiological and emotional stimuli through changes in conductivity, making it a valuable marker of autonomic nervous system activity. Based on Ohm's Law, changes in conductivity can be measured by the galvanic skin response (GSR), by maintaining a constant voltage with the individual in a series circuit. Controlled by the autonomic nervous system, the GSR is considered useful to indicate emotional arousal and stress (Lykken & Venables, 1971). This study investigates how Solfeggio frequencies impact skin conductivity, offering insight into their potential therapeutic applications.

## MATERIALS & METHODS

### Participants and Survey Completion

The study included 18 healthy participants (9 females, 9 males) aged 17–75, with a demographic breakdown of 12 Black and 6 White participants. Prior to measurements, each participant completed a demographic survey including age, race, and gender. Participants were also asked about their current mood, substance use, and familiarity with Solfeggio frequencies via multiple-choice questions. A post-treatment survey was also

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provided, where each participant “self-reported” their mood utilizing multiple-choice options. Specifically with emotion, individuals were asked to report how they were feeling before exposure to the Solfeggio frequencies, as well as after they were exposed; both surveys included an open-ended option labeled as “other” if the emotion was not listed, so that each person could report their mood. All consent procedures adhered to ethical guidelines established by the university’s research review board. Informed consent was obtained by each participant.

### Galvanic Skin Response and Solfeggio Frequencies

A “Solfeggio Frequencies Pure Tone” playlist by Emiliano Bruguera was developed that included six frequencies (396 Hz, 417 Hz, 528 Hz, 639 Hz, 741 Hz, and 852 Hz), as well as a combination of all six frequencies. Pure tone frequencies were utilized with the intent to maintain a constant frequency that has a singular pitch. Each participant was placed in an enclosed, 4 × 4 room by themselves (with the researcher), and asked to listen to each of the selected frequencies for five minutes. Everyone was requested to remain quiet, motionless, and in a seated position throughout sound exposure while avoiding crossing the knees or ankles. Each pure tone solfeggio frequency was projected for five minutes through a wireless speaker that was placed 6 inches away from the participant, and additional external sound was avoided. Sound intensity was controlled and monitored with a sound level meter. The sound level meter was positioned by the ear of each participant to obtain the loudness of each frequency being played. For each frequency exposure, the sound level was maintained within a range of 75 to 79 decibels (dB); the sound level was 62 to 64 dB during the pre- (control), post-frequency, and washout intervals, which provide an indication of the sound within the room when no frequency was being played. Conductivity was measured during each frequency exposure, as well as pre- and post-frequency exposure. Prior to electrode application, participants were asked to wash and dry their hands thoroughly. A Qubit (Q-S222) GSR sensor was connected to a Vernier LabQuest interface, where two electrodes were placed on the fingertip of the pointer and middle fingers of the left hand for each participant, providing real-time measurements of changes in the skin’s ability to conduct electricity in micro-Siemens ( $\mu\text{S}$ ). Participants were exposed to each frequency and a combination of the six frequencies in ascending order, for five minutes each with a 30-second washout interval in between

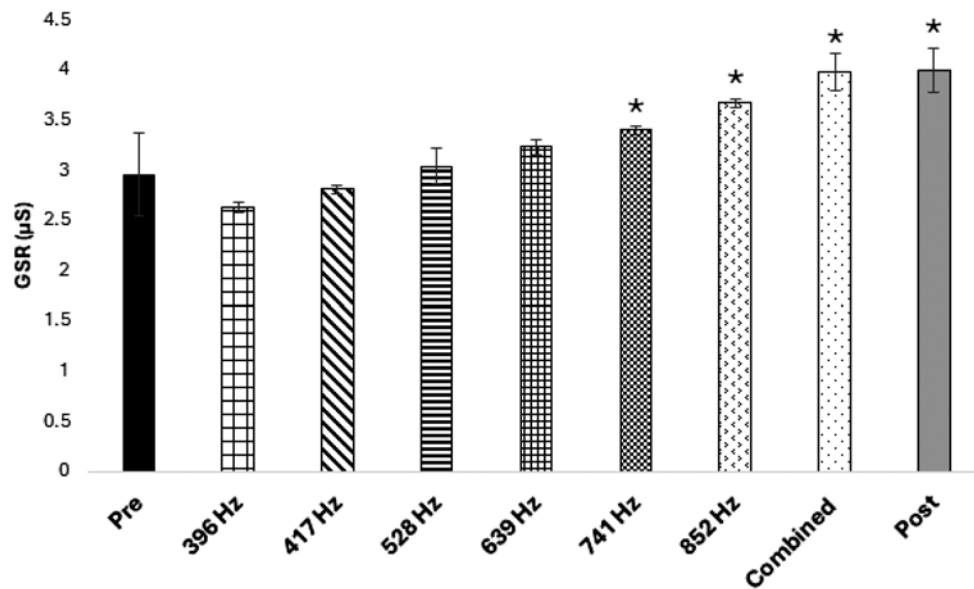
each measurement. Baseline skin conductance readings were collected prior to frequency exposure (control), followed by a post-exposure washout period (no sound being played). Participants were given a silent acclimation period at the beginning of the measurement session to allow for physiological stabilization, ensuring the refrainment of any influence on the baseline data from the novelty of the experimental setting. In addition, measurements were taken prior to all frequency exposure, post-exposure to all frequencies, and a combination of the six frequencies was obtained.

### DATA ANALYSIS

Repeated measures analysis of variance (ANOVA) was used to analyze the data to assess the different experimental conditions. Changes amongst the various groups were compared against the control (pre-exposure) condition. Statistical significance was determined based on a  $p < 0.05$ .

### RESULTS

The GSR measurements were collected in real-time and represented as an average of all participants after five minutes of frequency exposure. Compared to the control, there was a slight, insignificant decrease in the GSR after five minutes of exposure to 396 Hz ( $2.96 \pm 0.41 \mu\text{S}$  vs.  $2.63 \pm 0.05 \mu\text{S}$ ), followed by a linear increase in GSR with augmenting the frequency exposure. While there was some variability in GSR across participants, data analysis using repeated-measures ANOVA revealed statistically significant increases in skin conductivity for 741 Hz, 852 Hz, combined frequencies, and post measurements compared to control baselines ( $p < 0.05$ ), with no significant effects for the remaining frequencies (Figure 1). Interestingly, there was one participant that exhibited minimum change in GSR across the different frequency exposures. Eighty percent of the participants were unfamiliar with Solfeggio frequencies (data not shown). As shown in Table 1, the survey data revealed that 12 of the 18 participants experienced a neutral emotion before the study; 11 participants expressed this emotion after the study. Joy was the second highest emotion reported (6 participants: pre; 2 participants: post). Post measurements, five individuals expressed feeling annoyed, tired, and less calm (Table 1). These findings suggest a potential interaction between specific frequencies and autonomic arousal, implying that an increase in autonomic arousal correlates with an enhanced GSR.



**Figure 1.** Overall Galvanic Skin Response (GSR) for All Participants. Participants were exposed to six individual frequencies, as well as the combination of all frequencies as GSR was measured. Data is represented as mean ± SD, n = 18 (\* p < 0.05).

**Table 1.** Overview of Emotional Response to Solfeggio Frequencies.

Emotion	Number of Participants (PRE)	Number of Participants (POST)
Neutral/Content	12	11
Joy	6	2
Annoyed/Tried/Less Calm	0	5

## DISCUSSION

The skin is the largest and most sensory-rich organ, serving as the interface between the body and the external environment (Chen & Lyga, 2014). The findings of this study highlight its critical role in detecting and responding to external stimuli, such as pure tone sound frequencies. Skin conductivity changes, mediated by the activity of eccrine sweat glands, provide insight into the autonomic nervous system’s response to specific Solfeggio frequencies. These findings align with prior research suggesting auditory stimuli’s impact on autonomic responses (Kumar et al., 2022). Known as the “miracle tone”, 528 Hz is the one frequency that has been most scientifically studied and is suggested to attribute to emotional healing, DNA repair and lower stress (Akimoto et al., 2018). In this study, the self-reported survey data indicated that many participants were content before and after frequency exposure, yet there were several individuals who felt annoyed

following the experiment. Frequencies like 741 Hz and 852 Hz demonstrated measurable effects on conductivity, suggesting that auditory inputs can modulate physiological states, arousal or relaxation response. This supports prior research on the skin as a responsive medium for understanding emotional and physical well-being (Gatti et al., 2018; Nagai et al., 2019). There was one exception where a participant demonstrated no significant changes in their skin conductivity in all conditions, which is surprising as GSR changes are expected in the presence of external stimuli. When acknowledging the impact of sound on the body, it is important to consider the concept of resonance—the occurrence of a vibrating object causing another object to vibrate at a higher amplitude. For resonance to occur, the source of sound must emit a frequency that would be a natural sound to the other object. The standing human body naturally vibrates between 9–16 Hz, depending on posture, and may cause a substantial augmentation of vibrations when exposed to an external stimulus (Randall et al., 1997). These insights emphasize the potential of using the skin as a biomarker in therapeutic interventions aimed at stress and relaxation management.

## IMPLICATIONS AND APPLICATIONS

To our knowledge, the current study is the first of its kind to address the effect of pure tone solfeggio frequencies on the galvanic skin response. It was important to

use pure tone frequencies as they are simpler and easier to analyze compared to multiple frequencies that tend to have more complex waveforms. Participants were not screened for any underlying conditions that could potentially influence the data outcomes. While there is a small sample size involved, this study does address the limitation of data collection on underrepresented populations. We recognize that the results reveal an increased skin conductivity with higher frequencies, suggesting greater autonomic arousal. Because the GSR provides an indication to the electrical activity in the body and solfeggio frequencies promote balance, the findings in this study suggest that certain frequencies may have more benefits to overall health than others. For example, 741 Hz is believed to promote cleansing and detoxification, which may attribute to more arousal and irritability as the body attempts to re-establish balance; however, the exact cause for the observed effects remains unclear. This uncertainty lays the foundation to explore other issues and contributing factors of this variability such as underlying conditions, age, gender, non-Solfeggio frequencies, etc. Next steps include randomizing frequencies to account for sequential increases versus exposure.

## CONCLUSIONS

This study investigates the impact of Solfeggio frequencies on skin conductivity, a measure linked to autonomic nervous system arousal. Findings highlight the potential of specific frequencies, particularly 741 Hz, 852 Hz, and the combination of all six measured frequencies in modulating skin conductivity. Further research involving larger and more diverse populations is needed to better understand the therapeutic applications of these frequencies, especially in the context of stress reduction and relaxation-based interventions.

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## AUTHOR CONTRIBUTIONS

Tennille D. Presley: conceptualization (lead); data curation (lead); formal analysis (lead); funding acquisition

(lead); investigation (equal); methodology (lead); project administration (lead); resources (lead); writing—original draft (equal). Marcus K. Stamps: data curation (supporting); investigation (equal); methodology (supporting). Jennifer A. Davis Alexander: investigation (equal); methodology (supporting); project administration (supporting); writing—original draft (equal).

## AUTHOR DISCLOSURE STATEMENT

The authors have no conflicts to disclose or competing interests to declare.

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