# Vibro-Tactile Equalizer for Musical Energy-Valence Categorization

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**Abstract :** Musical haptic systems can enhance a listener's musical experience while providing an alternative platform for the hearing impaired to experience music. Current music tactile technologies focus on representing tactile metronomes to synchronize performers or encoding musical notes into distinguishable (albeit distracting) tactile patterns. There is growing interest in the development of musical haptic systems to augment the auditory experience, although the haptic-music relationship is still not well understood. This paper represents a tactile music interface that provides vibrations to multiple fingertips in synchronicity with auditory music. Like an audio equalizer, different frequency bands are filtered out, and the power in each frequency band is computed and converted to a corresponding vibrational strength. These vibrations are felt on different fingertips, each corresponding to a different frequency band. Songs with music from different spectrums, as classified by their energy and valence, were used to test the effectiveness of the system and to understand the relationship between music and tactile sensations. Three participants were trained on one song categorized as sad (low energy and low valence score) and one song categorized as happy (high energy and high valence score). They were trained both with and without auditory feedback (listening to the song while experiencing the tactile music on their fingertips and then experiencing the vibrations alone without the music). The participants were then tested on three songs from both categories, without any auditory feedback, and were asked to classify the tactile vibrations they felt into either category. The participants were blinded to the songs being tested and were not provided any feedback on the accuracy of their classification. These participants were able to classify the music with 100% accuracy. Although the songs tested were on two opposite spectrums (sad/happy), the preliminary results show the potential of utilizing a vibrotactile equalizer, like the one presented, for augmenting musical experience while furthering the current understanding of music tactile relationship.

**Keywords :** haptic music relationship, tactile equalizer, tactile music, vibrations and mood
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