



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Jonah L. Kohn	Project Number J0719
Project Title Good Vibrations: Improving the Music Experience for People with Hearing Loss Using Multi-Frequency Tactile Sound	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Most people with hearing loss cannot hear certain frequencies and sounds well or at all, which has a negative effect on their ability to experience music. The objective is to learn whether their experience of music can improve using multiple frequency ranges of tactile sound applied to multiple parts of the body.</p> <p>Methods/Materials The K-MAD (K. Music Assist Device) is an original device invented to conduct this experiment. It divides the sound spectrum into six frequency ranges, each one outputting to a vibrating speaker that is attached to subjects's fingers and/or sternum or combination.</p> <p>Fourteen subjects had their experience of music without and then with the K-MAD tested. Of these 6 were cochlear implant (CI) users and 6 were non-CI hearing aid (HA) users. Two subjects had hearing in normal-range. All subjects except for one CI and one non-CI HA users were younger than 65.</p> <p>Testing lasted over two hours per subject to identify the optimal position of the K-MAD device on their body. Once scores were recorded, subjects' ability to perceive melody, beat and lyrics were also tested. Subjects were asked to write about their experience.</p> <p>Results Using the K-MAD, all subjects with hearing loss, especially younger ones, showed improvement. The best results were recorded by the 4 cochlear implant (CI) users under 55, averaging a 93.5% improvement. The 5 CI-users younger than 65 reported an average 79.2% improvement. The 5 Non-CI hearing-aid (HA) users under 65 showed a 35% improvement. Normal-range hearing subjects reported almost no benefit.</p> <p>Conclusions/Discussion The primary groups who benefit from the K-MAD tactile device are younger cochlear implant (CI) users because tactile senses diminish with aging and CIs with their multiple channels are superior to hearing-aids for discriminating frequencies. Applying multiple frequency ranges to multiple parts of the body appears to help users enjoy a better experience of music by deconstructing the sound spectrum and enabling the user to reconstruct it with their body. Research, confirmed in parts of this experiment, suggests this may work because the K-MAD is providing frequencies that don't overlap those perceived through audio input.</p>	
Summary Statement This experiment is about improving the musical experience of people with hearing loss through multi-frequency tactile sound.	
Help Received Mother and father helped with display board, editing and proofreading, scheduling and driving. Device schematic drawn by electronics technician. Some background of previous research by inventor affiliated with MIT and researcher from House Ear Institute.	