



**CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY**

Name(s) Michelle C. Stanley	Project Number S1213
Project Title Can "Dr. Beat" Cause Damage to the Ear?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I play in the marching band where we use a Dr Beat when we rehearse our field shows. A Dr Beat is a loud speaker that is connected to a metronome. The beats from the metronome are amplified so that band members can hear the sound over the entire area of the football field. After practices, I have experienced ringing in my ears, clogged sinuses, the feeling of a swollen right eye, and finally, throbbing headaches. Based on this, I believe a Dr Beat can cause damage to the ear.</p> <p>Methods/Materials I set up the Dr Beat beside the football field in the same location and same manner as we do in practices. I arranged 24 orange pylon cones at different intervals on the football field to measure and record the decibel levels using a decibel meter. I tested the decibel level coming from Dr Beat at each pylon location three times. I then averaged the data and compared the results with a conversion table of intensity to decibel levels. I compared these results with materials from my research on hearing loss. I then made an appointment to have my hearing checked with an ear, nose, and throat specialist to discuss my symptoms after rehearsals.</p> <p>Results I found that 89 was the highest decibels produced by the Dr Beat. 42 decibels was the lowest. 60 was the average decibels produced. Dr. Rabinov (the specialist) conducted a physical examination of my ears. I also had a hearing test. The doctor determined that I experience temporary threshold shifts during practices which results in tinnitus and the symptoms I suffer.</p> <p>Conclusions/Discussion 60 decibels is not enough to immediately cause hearing damage. Anything over 85 can kill hair cells in the cochlea of the middle ear, and I did have a reading of 89 decibels. Dr. Rabinov advised me that repeated loud exposure will cause damage to my ears. We discussed a type of ear plug worn by many musicians. So, while Dr Beat does not cause immediate damage to the ear, long term exposure could cause damage to unprotected ears.</p>	
Summary Statement My project is about whether or not a Dr Beat can cause damage to the ear.	
Help Received I received help from the music and athletic departments at my school. My dad rented the pylons.	