



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

<b>Name(s)</b> Ashwin M. Gupta	<b>Project Number</b> <b>J0711</b>
<b>Project Title</b> <b>For Those About to Rock: A Study of Human Perception of Sound Quality</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this experiment is to see if people can hear different levels of quality for music subjected to audio compression and different playback devices. There are two types of audio compression: Lossy and Lossless. Lossy compression (MP3) works by removing "unnecessary" information. This creates a smaller, but lower quality, audio file. Lossless compression (FLAC, ALAC) removes repetitive data in a file, preserving audio quality but resulting in a larger file.</p> <p><b>Methods/Materials</b> Windows computer with commercial audio compression software and audio editing software, CD with music, high quality audio chain (Sonos music system, Receiver, Sennheiser headphones), low quality audio chain (iPhone 5s, Apple earbuds). Compressed music sample from CD into lossless, medium and high quality lossy, loaded samples onto iPhone and Sonos server, randomly labeled each sample, and asked listeners to rank from highest to lowest quality.</p> <p><b>Results</b> Listeners were able to reliably distinguish Lossless as better than Lossy on both playback chains, but actually did slightly better distinguishing between samples on the low quality chain. On the low quality chain listeners had an average 89% success rate while those on the high quality chain had only a 55% chance. On both audio chains, users had little success distinguishing between the two MP3 compression levels.</p> <p><b>Conclusions/Discussion</b> The results mostly disproved my hypothesis that people would be better able to distinguish between music compression levels on a better audio chain. Listeners were able to reliably distinguish lossless from lossy on both audio chains, but actually did slightly better on the low quality chain. One possible reason is that people are now used to low quality devices like earbuds since this is what we normally use. The two levels of lossy compression (MP3 192 vs 96) were hard to distinguish on either playback chain probably because the file sizes/quality are extremely similar. The results show that listeners who enjoy music quality should use lossless compression.</p>	
<b>Summary Statement</b> My project demonstrates that listeners can reliably distinguish music compressed at different sound quality levels even on a low quality playback device.	
<b>Help Received</b> I designed and preformed my experiment myself. My dad helped my decide which file formats and software to use for each device.	