



# CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

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<b>Project Title</b> Does the Bow Tension Affect the Volume of the Sound Produced on a Violin?	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The volume of a violin is an important quality that affects the way music is perceived by the audience. This experiment aimed to find how the tension of the violin bow affects the volume of the sound produced on a full (4/4) size violin.</p> <p><b>Methods/Materials</b> First, the violin and bow were tuned and set up for the experiment. The bow was adjusted to various tensions (independent variable), and played on the violin while the volume of the sound (dependent variable) was measured. The tension was indirectly measured using vector summation. The volume was then measured for 4 trials on the A string of the violin and the results were recorded. Included in the materials were a full size violin and bow, violin shoulder rest, tuner, seals, tape, ruler, table, decibel sound meter (dBZ), and a piece of string.</p> <p><b>Results</b> The lowest bow tension (23 14/41) yielded the lowest volume, while the highest bow tension (116 17/24) yielded the highest volume. The data shows the tendency of increased volume with increased bow tension.</p> <p><b>Conclusions/Discussion</b> Results supported the hypothesis that the volume would increase as the tension increased. As the tension increased by ~400%, the volume in sound power increased by ~57%. This is most likely due to an increase in friction between the bow and the string causing an increase in the amplitude of the sound wave. The result also shows that the testing environment, including the temperature and humidity, can have a significant impact on the measurements.</p>	
<b>Summary Statement</b> By accurately measuring the bow tension, its relationship with the violin volume was quantitatively studied within a controlled environment in this project. The results confirm the dependency of volume on the bow tension.	
<b>Help Received</b> I would like to thank Mrs. Alexander, Mr. Laky, Ms. Orosz, Mrs. Tsai, and my friends Diyya Ganju and Kieli Murray for giving me advice and feedback. I would also like to thank my mother for teaching me how to create a graph and my father for his advice and help during the experiment.	