



# CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

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| <b>Name(s)</b><br><b>Harsha V. Thangavijayan</b>  | <b>Project Number</b><br><br>36863 |
| <b>Project Title</b><br><b>Can Light Control Heart Rate?</b>  |                                    |
| <b>Objectives/Goals</b><br>The objective of my experiment was to find out if red light, blue light, and UV light had the ability to affect the heart rate of Daphnia magna. My goal was to find a non-invasive approach using only light, as opposed to gene therapy to control the heart rate.<br><b>Abstract</b><br><b>Methods/Materials</b><br>The materials I used for my experiment were 20 Daphnia magna, microscope, red filter, blue filter, UV torchlight, and a timer handled by a helper. Place your first test specimen on the microscope and record the heart rate for 15 seconds. Repeat this 2 more times. Place the red filter on the stage light, and let the Daphnia magna be exposed for 2 minutes. After 2 minutes, count the heart rate for 15 seconds. Repeat this twice more with a 45 second interval. Remove the red filter and let the Daphnia magna be exposed to stage light for two minutes. After two minutes, place the blue filter and let the specimen be exposed for two minutes. Count the heart rate three times for 15 seconds with a 45 second interval. Remove the blue filter and let the Daphnia magna be exposed to the stage light for 2 minutes. Mount the UV torch and expose it on the Daphnia magna for 2 minutes. Count the heart rate thrice for 15 seconds with a 45 second interval. Repeat the entire procedure using 19 different Daphnias, recording their heart rate under all three lighting conditions with the same amount of time specified above.<br><b>Results</b><br>My hypothesis was supported by the results as the heart rate of Daphnia magna increased. I statistically analyzed the significance of the effect of light upon the heart rate using a paired one-tailed t-test, which showed that the heart rate was significantly higher on exposure to blue light, red light, and UV light.<br><b>Conclusions/Discussion</b><br>This experiment has so much potential in the future because it can revolutionize the way we study the heart, which could save millions of people with cardiovascular diseases. Big journeys start with small steps, and since my experiment was a success, researchers can even find a way to control the beating of the heart without gene therapy. I also successfully used a non-invasive method to affect the heart rate using only light, just like I envisioned. |                                    |
| <b>Summary Statement</b><br>I proved that a non-invasive method such as red, blue, and UV light could significantly increase the heart rate of Daphnia magna, and can act as the basis to find a non-invasive way to control heart rate using only light.   |                                    |
| <b>Help Received</b><br>Dr. Bub, from the University of Oxford provided valuable feedback throughout my experiment and gave me the idea of conducting a t-test.   |                                    |