



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Arman Z. Abbassi	Project Number J0701
Project Title Teaching Children with Down Syndrome: The Effect of Positive Motivators	
Abstract Objectives/Goals The objective of my study was to determine if the use of positive motivators would strengthen and enhance the learning capabilities of children with Down Syndrome. Methods/Materials Computer for showing videos, videos corresponding with child's identified positive motivators, parent survey, and typed visual aid. Showed five videos in same order every day with spoken and visual concept repeated after each video; outcome measured after every five days of testing for a total of fifteen days. The identified learning concept for this subject was self-control with babies and dogs, and I reinforced the phrase "One time, then all done." Results The subject was engaged in the study and she was receptive to the learning concept. Specifically, her behavior was more controlled with each of three successive tests. Conclusions/Discussion The use of positive motivators did strengthen the subject's learning capabilities through time, repetition, and routine. If families and educators work together to identify positive motivators for the specific child and use them in the classroom and home, they can enhance the learning capabilities of children with Down Syndrome.	
Summary Statement By identifying and using positive motivators the learning of children with Down Syndrome is enhanced and strengthened.	
Help Received I devised, set-up, and conducted the experiment myself. The subject's mother helped by supervising the subject during the experiment and tests.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Vivian Avila	Project Number J0702
Project Title The Effectiveness of Signage	
Abstract Objectives/Goals The objective of this experiment is to determine if signage encourages people to recycle more in order to help the environment. Methods/Materials To experiment on how people would respond to signs that invited them to recycle, I invited two groups of people to eat pizza on plastic plates. Both groups had available a recycling bin, but one group had no informational sign next to the bin; the other group's bin had a sign indicating the benefits to our environment when we recycle. I told them I was experimenting on them by seeing their opinions on paranormal things because if I told them that I was experimenting on them to see if they would recycle, then they would obviously recycle. Results I discovered that the sign on the recycling bin that indicated the benefits to our environment when we recycle did encourage people to recycle. Conclusions/Discussion It is concluded that signage does increase recycling participation. This data is important to us because then people would recycle more and the environment would really benefit from that.	
Summary Statement As measured by how many people recycled, I found that people showed a significant difference in recycling with a sign about the benefits of recycling to the environment on the recycling bin.	
Help Received I designed the experiment myself. My science teacher guided me throughout the project and she especially helped me find a good question.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Yasmine Baker	Project Number J0703
Project Title Does Color Affect Comprehension?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study was to determine which text color has the greatest positive impact on comprehension. I hypothesized that red will have the most considerable impact as previous studies have demonstrated that this color generates feelings of excitement and intensity.</p> <p>Methods/Materials A printer, paper, pen, and test subjects were needed to complete this project. In order to control for individual comprehension ability within a sample, I gave students a ten question comprehension quiz, then selected those who scored between three to eight. Then, a pre test on a certain topic was given to see how much information they knew about the topic. Next, the subjects were given a short essay on that topic in one of four selected colors. After that, the subjects took a post test to see how much information was gained. This phase was repeated with three different colors and groups, and to confirm the results, another phase was completed, this time, with another topic.</p> <p>Results In my experiment, I discovered that red and black affected comprehension the most (its average improvement for phase 1 was 3.46). The next most effective color was green at 3.15, then blue at 2.46. In phase 2, black affected comprehension the most, at an average improvement from pre-test to post-test of 1.83. The next two most effective colors were red and blue with an average improvement of 1.58, then green at 1.50. I also looked at many others characteristics that would control for them.</p> <p>Conclusions/Discussion The final data supported my hypothesis. The colors red and black are best for comprehension. Students should implement the results from this project to determine what color text facilitates their learning. The experiment expands our knowledge about comprehension by demonstrating that different colors affect students differently. This project is extremely important because these results need to be taken into consideration in academic settings to help student achieve optimum comprehension. Future experiments include figuring out other variables that affect comprehension.</p>	
Summary Statement I tested middle schoolers to see which text color would positively affect comprehension the most, and found that red and black colored text help facilitate optimum comprehension.	
Help Received I designed, performed, and analyzed the data by myself. The only help I received was with my science teacher who gave me a couple of ideas on ways to analyze my data.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Hanna M. Beck	Project Number J0704
Project Title How Sleep Deprivation Impacts Students' Memory	
Abstract Objectives/Goals The objective of this study was to determine if six hours of sleep a night for a week made a difference in memory compared to sleeping for eight hours a night for a week. Methods/Materials I had my participants sleep for six hours a night for a week and then take an online memory test that calculated how well a participant could recreate a pattern that they were shown. I then had them take the same memory test after a week of sleeping for eight hours a night. Then I gave them an hour to study with fake information I made up so they couldn't use any prior knowledge. I then had them sleep for six hours a night for a week again. After the week I tested them on the information I gave them earlier to test their long-term memory. I then repeated this with different data and the participants sleeping for eight hours a night this week. Then I compared the results from the two sets of weeks. Results The first set of data that tested short-term memory showed about a 38% increase on average in scores from the first week to the second week. The second set of data that tested long-term memory showed about a 16% increase on average from the first week to the second week. This proves that the number of hours of sleep a child receives does make an impact on their short and long-term memory. Conclusions/Discussion Although there have been studies that have shown the impact that sleep has on memory, none that I have found have done an experiment specifically on jr. high school students. My results prove that the number of hours slept makes a huge impact on young learners and the difference just two hours more of sleep has on their memory and subsequently their studies.	
Summary Statement I showed that two hours more of sleep makes a considerable difference on 8th graders short and long-term memory.	
Help Received I designed and performed the experiment by myself but was coached on how to interpret my results by my science teacher, Mr. Jackson.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Leah J. Booth	Project Number J0705
Project Title The Effects of Background Noise on Auditory Perception	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study was to determine if background noise affects hearing.</p> <p>Methods/Materials 75 students, scripts, downloads of background noise (static, music with words, music without words, coffee shop noise), speaker. Read script to students with different background noises playing. Students wrote down facts that they could recall afterwards. Then had students read a different script to themselves with the same background noise. Then they wrote the facts they could recall.</p> <p>Results The results showed that having background noise of music with words impacted their ability to listen, understand and remember information. They could not recall as many facts from the articles when the music with words was played in the background. My experiment also showed that overall, when static was played in the background while being read to, students were able to recall the most facts.</p> <p>Conclusions/Discussion The information gained from this project could be useful for teachers who are concerned about background noise and its implications on hearing and recalling information. A teacher could use this data to create an optimal environment for students for learning.</p>	
Summary Statement I discovered people have a difficult time listening and recalling facts from an article when various noises were playing in the background, particularly when they were listening to music with words.	
Help Received My science teacher, Mr. Scott, helped me analyze my results.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Kayla H. Brewer	Project Number J0706
Project Title The Effects of Visual Distraction on Recall	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals I visited the Museum of Science in Boston and came across an experiment that focused on attention span. I was inspired by this exhibit to design a project to test visual distractions and their effects on the ability to retain information. The purpose of this project was to discover whether distractions impair the ability to comprehend and memorize information. Based upon on my research, I believed that distractions, even small ones, might impair the ability to comprehend and memorize information.</p> <p>Methods/Materials 124 test subjects participated in grades 5 through 8. I came up with a list of 15 words for test subjects to attempt to memorize and recollect. I also created animations such as a ball bouncing, a pinwheel spinning, and a line oscillating as my "distractions." I created a video with the list of words and the distractions beside them to test half of the subjects. In each grade, I tested one class with the list of words alone and the other class with the video, which showed the word list and the distractions. The subjects were given time to memorize the words silently, wait silently afterwards, then write the words they could recall on response forms I created. I collected and analyzed the data.</p> <p>Results The mean number of words remembered by participants who were shown the video was significantly fewer than the number of words remembered by participants just shown the word list alone. Participants shown the word list alone scored an average of 23.6% higher in fifth grade, 38.0% higher in sixth grade, 17.8% higher in seventh and 16.9% higher in eighth grade than those shown the video. The number of words remembered ranged from none to all 15 words remembered!</p> <p>Conclusions/Discussion Overall, the findings supported my hypothesis. The distractions in the video seemed to have a large impact on the brain's focus. At every grade level there were significantly more words recalled by those who viewed the word list without distraction. According to my results, the impacts of a visual distraction appeared to be even greater with younger students (the fifth and sixth graders) than with seventh and eighth graders, but even the seventh and eighth graders were still greatly affected.</p>	
Summary Statement My project is about testing the effects of visual distractions on the ability to memorize and recall information.	
Help Received My science teacher assisted me in testing the classes. I graded and recorded all tests myself.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Danna Bundogji	Project Number J0707
Project Title Is Technology Good for Us After All?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study was to assess the difference in reading comprehension of middle school students when using paper or digital reading sources. I also aimed to assess the role the environment plays on reading comprehension.</p> <p>Methods/Materials Middle School students were randomized into two groups: paper reading group vs. digital reading group. Group type determined which reading source the student read from during the experiment (for example: students in the paper reading group read from a paper while students in the digital reading group read from a tablet). Reading comprehension was also assessed by administering three exams under three different conditions: untimed, timed, and interrupted.</p> <p>Results Overall, the digital reading group did 1.43% than the paper reading group. The untimed experiment showed a 5.85% score increase in the paper reading group compared to the digital reading group. The timed experiment showed a 1.38% score increase in the paper reading group compared to the digital reading. Lastly, the interrupted experiment shoed a 10.41% score decrease in the paper reading group compared to the digital reading group.</p> <p>Conclusions/Discussion My results demonstrated that there was an insignificant difference (1.06%) between reading comprehension scores of students in the on-screen and paper reading group. The testing condition affected reading comprehension scores in both groups showing a significant percent difference (un-timed: -5.85%; timed: -1.38%; interrupted: 10.41%). The environment seemed to play a larger role on reading comprehension than the reading source.</p>	
Summary Statement Although reading source (paper vs. digital) did not play a significant role on reading comprehension scores of middle school students, the environmental condition had a substantial impact.	
Help Received I gathered materials, administered experiments, and collected data. My coach, Najwan Naserelddin, gave me constant feedback and support throughout my project.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Akhilesh Chegu; Deven Shah	Project Number J0708
Project Title The Effect of Interrupted Sleep on Cognitive Behavior and Neurophysiology in Drosophila melanogaster	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Our experiment's objective is to determine interrupted sleep's effect on cognition. Common diseases like sleep apnea and generalized anxiety disorder interrupt sleep instead of depriving it, but, taking a closer look, we realized that minimal pre-existing experimentation had been performed on interrupted sleep. We hypothesized interrupted sleep would lower cognitive capabilities compared to normal sleep.</p> <p>Methods/Materials We used Drosophila melanogaster as our animal model for the sleep study. Our experiment regulated Drosophila sleep using blue lights controlled by an Arduino. We divided fruit flies into four test tubes; one tube was a blue light control, one functioned on normal sleep, one's sleep was interrupted, and one tube was deprived of sleep. Interrupted sleep was defined as 5 minute waking periods every two hours of sleep in the night. Deprived sleep was defined as obtaining half the amount of normal sleep in Drosophila, or four hours. Our experiment measured cognition through memory and reaction time, which was tested through attraction to vinegar.</p> <p>Results For reaction time, we measured their reaction time in comparison to each other across the 8 days. Flies with interrupted sleep consistently had the fastest reaction time(5-7 seconds) whereas those with deprived sleep has the slowest(13-16 seconds). In our second experiment, classical conditioning, we took their average reaction time and compared it to the reaction with the fake Q-tip stimulus. We found a similar change of 5 seconds between the two times for all types of sleep. However, that time change meant that interrupted sleep was almost doubling the average reaction time, indicating that another factor that was playing a role.</p> <p>Conclusions/Discussion We concluded that this heightened vigilance occurred due to an increased level of cortisol and adrenaline. We believe the loss in memory is due to the lack of REM sleep obtained each night. Restarting from the beginning of each sleep cycle every time the subject wakes up means that the last stage of the sleep cycle, REM, is never acquired in adequate amounts. In the future, we could use sleep monitors on humans. We could also test for synaptic protein levels to probe the effects of interrupting certain sleep stages on daily activities.</p>	
Summary Statement We discovered that interrupted sleep led to quicker reaction times, but severely decreased memory and learning capabilities.	
Help Received We designed the experiment and Arduino programs ourselves. Our teacher provided vinegar, Arduino wires, outlets, and other common materials to us for our experiment. We bought our fruit flies from Carolina.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Jasmine E. Elasaad	Project Number J0709
Project Title Effectiveness of Method of Loci on Short-Term and Long-Term Memory	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study was to determine if the method of loci, a visual-spatial oriented mnemonic device, has an impact on long-term memory. The hypothesis was that the group using the method of loci would recall more words than the rote memorization control group.</p> <p>Methods/Materials A total of 134 students in grades fifth, sixth, seventh and eighth were recruited and then divided into two groups: the method of loci experimental group; and the control group. Prior to testing, the method of loci group received training on how to use the method of loci technique to memorize a list of words, while the control group received no training. Both groups were given identical lists of 20 simple nouns and four minutes to study the lists. After the word lists were collected, the groups were subjected to a 1.5 minute period of silence before being tested on their short-term recall ability. Subjects were given two minutes to write down all the words they could remember. All participants were then re-tested one week later for long-term recall of the word list.</p> <p>Results For the short-term recall results, the control group recalled a mean of 15.5 words (median 16; mode, 20; range 6-20.) The experimental group using the method of loci recalled 16% more words than the control group, with a mean of 18 words (median 19; mode, 20; range, 11-20). For the long-term test results, the control group recalled a mean of 7.7 words. (median, 7; mode, 5; range, 0-20). The experimental group which had used the method of loci was able to recall a mean of 11.9 words (median, 12; mode, 15, range 1-20) on the long-term memory test. This was a dramatic difference of 54% more words recalled for the long-term test by those using the method of loci.</p> <p>Conclusions/Discussion The method of loci is one of the oldest mnemonic devices and employs a spatial skills technique to peg desired words along the route of a memory journey. The results of this study revealed that subjects were able to recall more words when they employed this memory tool. Recall ability was magnified over longer periods of time, suggesting that this mnemonic device would not only be of great use to students, but would be even more valuable for those who need to retain information over a long period of time. Further studies might be beneficial comparing different mnemonic devices to determine which is most effective.</p>	
Summary Statement I tested the effectiveness of the method of loci mnemonic device on students' short-term and long-term recall ability.	
Help Received I received help from the students who participated as subjects in my project and from my science teacher who let me use her classes for testing and gave me guidance.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Hannah Filly; Cailin Templeman	Project Number J0710
Project Title How Do Stimulants Affect the Perception of Time?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This project was designed to discover how different types of stimulants affect the ability to perceive time. We hypothesized that sound would affect subjects estimations of time, due to our research on studies about how music influences brain activity and alters perception.</p> <p>Methods/Materials Subjects were led into a room without clocks or other devices that could distract them. We tested 3 groups in total. In the sound group, subjects listened to piano music. In our touch group, subjects made a puzzle, and in our control group, subjects did not participate in any activity. All subjects did this for the duration of the test period. We left the subjects for 4 minutes, and when the period of time ceased, we asked them to estimate the amount of time they were left alone. We selected subjects all in the same age range to best control age factors.</p> <p>Results Our graph shows that students solving a puzzle estimated an average of 2 minutes 35 seconds, students listening to music estimated an average of 4 minutes 13 seconds, and students doing nothing estimated an average of 7 minutes. The most accurate group was listening to music.</p> <p>Conclusions/Discussion Our data indicate that students listening to music estimated time more accurately, while students playing the puzzle and students doing nothing estimated time less accurately. We believe this is because students with no stimulation believe time to pass slower, and students solving a puzzle believe time to pass quicker. Our results contradicted our hypothesis, but we still found conclusive results.</p>	
Summary Statement We found that when the brain is more active performing a task, the subjects perceive less time having passed.	
Help Received We designed and conducted our experiments independently, with guidance from our advisor.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Diyya Ganju; Kieli Murray	Project Number J0711
Project Title The Effect of Gender on Short-Term Memory Recall	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine how gender affects short-term memory recall of pictures, numbers, and words in 11-13 year olds. We predicted that girls would have a higher recall rate due to the more advanced language skills of girls in this age group.</p> <p>Methods/Materials Created a slideshow with with three slides of seven digit numbers, three slides of seven objects each, and three slides with five words each. Had 163 informed test subjects ranging in age from 11-13 view the slides, then after a ten second period they inputted as much data as they remembered from the slide into a Google Form.</p> <p>Results Girls slightly outperformed boys on the numbers section (5.18 to 4.86 out of seven) and the words section (2.88 to 2.79 out of seven), but boys slightly outperformed girls on the pictures section (4.18 to 4.13 out of seven). There was only a 1.14% difference between the two genders' overall averages.</p> <p>Conclusions/Discussion After multiple trials spanning 163 test subjects, we have found there is no statistically significant difference between the short term memory recall of females and males. To conclude, gender does not have a significant affect on the short-term memory recall of 11-13 year olds.</p>	
Summary Statement We devised a memory test and administered it to 11-13 year old males and females, and after analyzing their scores we found that gender does not affect short-term memory recall in this age group.	
Help Received The sixth grade teachers at College Park Elementary generously allowed us to test their students.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Nina M. Hollars	Project Number J0712
Project Title Shaping Your Thoughts	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to determine if the age of a person affects their ability to complete the Stroop Effect Tasks. Additionally, what factors can influence an individuals results.</p> <p>Methods/Materials This experiment was conducted with different age groups, both male and female,testing their ability to complete the Stroop Effect Tasks which involves colors, shapes, and words. Materials required included a stopwatch, test sheets, desk top computer, and volunteers.</p> <p>Results After completing all my research and interviews, I learned that the age of a person does indeed affect their ability and time to finish the Stroop Effect Tasks. Those over 50 years of age that were part of this experiment had a more difficult time completing the tests.</p> <p>Conclusions/Discussion In conclusion, I know that age does affect the abilities to complete the Stroop Effect Tasks. Older people, especially those over the age of 50, had much longer times completing the test. Other factors to consider on this topic include but are not limited to substance abuse, trauma to the head, colorblindness, and educational level.</p>	
Summary Statement Using time as a measurement, younger people complete the Stroop Effect Tasks much quicker than older people with many additional factors to consider along the way.	
Help Received I researched my data on-line while gathering information and performing tests on people in our community. Mrs. Heermance and Mr. Landgraph provided useful recommendations during the County Science Fair.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Cosette O. Monson	Project Number J0713
Project Title The Earworm Effect	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Which gender, between eleven to thirteen year olds, will experience INMI (Involuntary Musical imagery) more, after listening to clips of three well known songs?</p> <p>Methods/Materials I clipped the three well known songs to make one three minute long song. I played the video in each class. The next day, I had the class fill out a survey asking questions about their experience with those songs and INMI. There were 186 participants.</p> <p>Materials: surveys (created to ask questions about INMI) Speaker or way to play music male and female students from 11-13 years old</p> <p>Results The males had 35.6% did not experience INMI with a song from the video and 64.4% did. Of the male students who did not experience INMI with a song from the video, 29.4% had an outside song in their head. Of females, 16.7% did not experience INMI with a song from the video and 83.3% did. Of the females that did not experience INMI with a song from the video, 37.5% had an outside song in their head. Overall females experienced INMI more than males. There is an 18.9% difference between females and males who had songs stuck in their heads, which is significant. Of those who didn't get a song from the video stuck in their head, more females than males had an outside song stuck in their head, a difference of 8.1%.</p> <p>Conclusions/Discussion Between eleven to thirteen-year-olds, females experienced INMI more than males after listening to clips of three well known songs. This research was important because differences in the male and female brain is a fairly new area of study and Involuntary Musical Imagery is shrouded in speculation.</p>	
Summary Statement I concluded that 11-13 year old females will experience INMI (involuntary musical imagrey) more than males.	
Help Received My teacher guided me through the process of making my science fair, but I completed the project and experiments by myself.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Kali E. Nishimine	Project Number J0714
Project Title Does Red Bull Improve Cognitive Performance?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to determine the effects of drinking Red Bull on the test subjects' performance of cognitive tasks.</p> <p>Methods/Materials Stopwatch, "Perfection" game, 24 Red Bulls. Volunteers were asked to complete the task of fitting various geometrically shaped and sized pieces into their corresponding spaces while being timed. Upon completion, subjects repeated the timed task 15 minutes after drinking a can of Red Bull.</p> <p>Results Although 26 people volunteered for the study, only 24 people completed the study citing either difficulty with fine motor skills or due to health concerns with consuming energy drinks. The difference in times indicated that the majority of subjects performed better after consuming Red Bull. In fact, only 3 subjects increased their performance times and the average subject improving their test time by 25 seconds.</p> <p>Conclusions/Discussion Based on the data collected, it appears that consumption of Red Bull should improve performance in hand-eye coordination, shape recognition and sorting of varied size and geometric pieces. While this study does not prove an increase of cognition when consuming Red Bull, it does imply that there is a marked improvement in performance for most people. Further study is needed to ascertain whether the effects of coffee or a caffeinated soda would have similar outcomes as drinking Red Bull.</p>	
Summary Statement As measured by the time it took to complete different geometric shape and size sorting task, I found that Red Bull improved most test subjects' performance.	
Help Received I designed the project after researching energy drink studies and discussing specific cognitive tests with my mentor Lynda Kubota.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Fatima Nour	Project Number J0715
Project Title Learning Style vs. Memory	
Abstract Objectives/Goals The goal of this experiment is to find which way of processing information, auditory or visual, is the optimal way to remember and recall information. Methods/Materials I gave 60 Students, Ages (11-13) a learning style assessment designed by professional teachers and psychologists. After recording everybody's preferred learning style, I gave them two different visual memory tests and two different auditory memory test. Results The results showed that the majority of the students were able to retain information better when provided with visual aids. Surprisingly, the auditory learners scored 29.80% higher in the visual memory test than in the auditory test. The tactile learners scored 40.27% higher on average in the visual memory test than in the auditory memory test, and as expected, the visual learners scored higher in the visual memory test by 60.54% than on the auditory memory test. Conclusions/Discussion In conclusion, while some people in this test may have stronger auditory memory or equal strengthened memory, most people can remember something better when it was presented to them visually regardless of their learning style. The results showed no link between the students' learning style and memory. Most of the students, including the auditory and tactile learners, scored higher on their visual memory tests. A small amount of people compared to visual learners are auditory learners.	
Summary Statement The goal of this experiment is to find which way of processing information, auditory or visual, is the optimal way to remember and recall information.	
Help Received My School allowed me to test middle school students	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Revere D. Schmidt	Project Number J0716
Project Title A Prescription to React Faster: Combining Video Gaming with Extracurricular Activities	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to determine what is the most effective way to improve reaction time. It assesses how experience playing video games, an instrument, or a competitive sport; working on multiple devices with multiple applications; or taking challenging honors math courses impact reaction time.</p> <p>Methods/Materials Subjects completed a questionnaire to collect the number of hours per week spent on the following activities: playing video games, sports, and an instrument; taking advanced math classes; and working with computer and phone applications. Subjects then drove a remote control car twice around two different obstacle courses, once while looking at the car directly, and once while looking at it through an iPad camera. The total amount time in addition to the number of corrections and errors were collected for each subject on each of the four runs.</p> <p>Results The results show that subjects with the best reaction time, measured by speed and accuracy on the obstacle courses, play a combination of video games and activities that require fast reaction time. Specifically, subjects with the best reaction time play more than 6 hours of video games a week, averaging 18.7 hours, and participate in 2 to 3 activities requiring quick reaction time, averaging 2.6 activities. Playing video games in combination with at least one activity will also improve reaction time, though less effectively. Finally, subjects with no video game experience have very poor reaction time and accuracy.</p> <p>Conclusions/Discussion In conclusion, while playing video games improves reaction time and accuracy, playing games alone is not the most effective way to improve in these areas. Importantly, gaming for more than six hours a week in combination with doing three activities that require quick reaction time is the most effective way to improve reaction time. If time is limited, it is possible to improve reaction time, though not as effectively, by playing video games with one other activity. These activities are, from most to least effective, playing an instrument, taking advanced math classes, and doing sports. Additionally, never playing video games results in poor reaction time and accuracy. To be a skilled surgeon, a successful football receiver, or a quick and accurate SAT test taker, some video game play time every week is key.</p>	
Summary Statement As measured by driving a remote control car on two obstacle courses, reaction time is most improved by playing video games in combination with doing activities that require fast reaction time.	
Help Received My mother helped me to set up the obstacle courses, hold the iPad camera, and set up the Excel database. My dad helped with the charts and graphs. My teacher helped refine the study topic.	



CALIFORNIA SCIENCE & ENGINEERING FAIR

2018 PROJECT SUMMARY

Name(s) Stephanie K. Stahovich	Project Number J0717
Project Title How to Keep Your Cool: Controlling Thermal Comfort by Applying Temperature Impulses to the Wrist	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In the US, space heating, cooling, and air conditioning account for 39% of energy usage in homes. The goal of this project is to find a way to reduce the amount of energy needed to make people feel cool in warm environments. More specifically, this project examines if cooling a small patch of skin can make a person feel cool without needing to cool an entire building. If successful, this method of cooling could help to reduce greenhouse gases and reduce the amount of money people spend on air conditioning.</p> <p>Methods/Materials I created a system that uses a Peltier module to apply temperature impulses to a person's wrist. The system also includes a Raspberry Pi computer, a temperature sensor, relays, a heat sink, and a fan. I created a computer program to control the impulses. The program allows the operation protocol for the impulses to be adjusted. I conducted a study in which participants evaluated the effectiveness of the system for different values of the operation protocol.</p> <p>Results The data from this experiment showed that most participants felt cooler because of the system when the settings for the operation protocol were adjusted to fit their preferences. All participants preferred a duty cycle of less than 50 percent. The duty cycle is the fraction of the cycle during which the Peltier module is powered on. Most of the participants preferred the Peltier module to be turned on only for a small fraction of time to feel cooler.</p> <p>Conclusions/Discussion My studies demonstrated that when a proper sequence of cooling impulses is applied to a small region of a person's skin, the person's perception of how cool they feel can be controlled. In my experiments, seven of the eight participants felt cooler because of the system. This project has resulted in several important findings. First, it suggests that there is a way to make someone feel cool without having to cool their entire body. Second, my data supports the theory that when the temperature of one part of the body is changed, the brain perceives that the temperature of the entire body has been changed, too. Third, my project suggests that the brain is sensitive to high rates of temperature change. This project has significant implications for people who want to reduce energy usage in their homes. This work is a step toward creating an energy-efficient, wearable system that enables people to be cooled through only a small patch of skin.</p>	
Summary Statement This project demonstrated an energy-efficient method for controlling a person's thermal comfort by applying carefully controlled temperature impulses to their wrist with a Peltier device.	
Help Received I came up with the project idea and did the experiments. My father provided guidance on connecting the electronics and taught me how to write the python program to control the system. He also assisted me by critiquing my writing and poster.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Tye J. Sutherland	Project Number J0718
Project Title Reaction to Action	
Abstract Objectives/Goals The objective is to determine if there is a difference in reaction time for people that play action video games versus those that do not play action video games. Methods/Materials Materials List: 24 test subjects: 12 subjects that played action video games and 12 subjects that played non-action video games or no video games, laptop computer, free computer reaction time website, ruler with reaction time marked in msec (formula $d = \frac{1}{2}at^2$ where d is the distance, a is acceleration due to gravity (9.81 m/s ²), and t is time) Procedure: Test 12 action playing subjects with the computer app 5 times each, repeat with 12 non action playing subjects, record data. Test same subject groups again with ruler drop test. Measure fingers 3 cm apart, put hand at line, experimenter drops ruler, subject catches ruler as fast as they can, record measurement, test each subject 5 times, record data. Results The action gamers had an average score for the computer test of 293 ms, and had an average score of 154 ms on the ruler test. The non-action playing subjects tested with an average of 393 ms on the computer test and an average of 179 ms on the ruler test. There was a significant difference in reaction time between the two groups for both tests. The action video gamers had a faster reaction time with both tests. Conclusions/Discussion After testing 12 action gamers and 12 non-action gamers, I concluded my hypothesis correct by showing that people who play action video games have a faster reaction time than people who do not play action video games. I used two different tests to account for any bias or inaccuracy in testing. This experiment would be easy to reproduce. This proves that there are positive effects from action video games. These effects could be used to train people for specific benefits or careers.	
Summary Statement Action video game players demonstrated a faster reaction time than non-action video game players thru multiple tests.	
Help Received My parents and science teacher assisted me in refining my project.	



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

Name(s) Jyothikaa Ramann	Project Number J0799
Project Title The Posture Genie: "Better Posture, One Buzz at a Time"	
Abstract Objectives/Goals My objective is to examine whether awareness of incorrect posture, communicated through as reminders, will induce a postural improvement among humans of all ages. Hypotheses: 1) Posture Genie device helps users build an awareness of incorrect posture through persistent reminders generated by the device when they slouch. 2) Prolonged use of Posture Genie results in progressive and sustained improvement in overall posture and health. Methods/Materials The Posture Genie is a smart programmable device built to track and warn when you deviate from your correct posture. Posture Genie's base circuit is constructed with various chips, such as a Triple Axis Accelerometer and Piezo Vibration Motor. To use the device, attach it your shirt using a magnet. Position yourself in your best posture. By pressing the button, the device will buzz three times confirming calibration of your correct posture. The Posture Genie will gather your data and report your time in minutes per hour spent with good posture vs not. Use Posture Genie for one 12-hour period without vibrations to record your normal posture as a baseline. After, use the device for multiple 12-hour periods until you observe noticeably reduced or zero vibrations over contiguous periods. Results Posture Genie experiment was conducted among various users from wide range of age groups. Our experiment included 3 device trials for 12-hour periods excluding the baseline period. Subject A representing an age group of 10-20 years had an average of 56% increase in GPM (Good Posture Minutes) compared to baseline. Subject B, aged between 40 and 50 years had a 54% GPM. Subject C in 30 to 40 years age range had a 59% increase. Subjects E and F represented an older age range of 60-70 years who had a 44% increase. Without vibration reminders from Posture Genie they had an average of only 13 GPM per hour. But using the device in 3 experiments showed a 220% increase in GPM to an average of 28.6 minutes. Conclusions/Discussion The results of the experiment confirmed hypothesis #1 that use of The Posture Genie resulted in improving overall posture of users by increased awareness of their incorrect posture through persistent reminders. Results of the extended experiment on all subjects provides strong evidence to prove hypothesis #2 that use of Posture Genie provides progressive improvement and sustenance of good posture by a consistent increase in GPM.	
Summary Statement I used the Posture Genie device to test whether reminder and observation of postural imbalance can induce postural improvement and better health and body conditions.	
Help Received I built the circuit with the help of Shenzhen Ding Hao electronics in providing me with my basic circuit. My got help with the programming of the app. The subjects who volunteered in this project also helped in proving my experiment.	