



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Sundus Alzeinat; Sabahat Nabiha	Project Number S0401
Project Title Exploring the Efficiency of Neuroplasticity on the Concentration Levels and Memory of ADHD Patients	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Attention Deficit Hyperactivity Disorder causes the patient to struggle to focus and have a low attention span. The drugs that are the primary treatment, are highly addictive and may cause addiction. We sought to use Neuroplasticity that states the brain can rewire/adjust itself to solve the given situation. We attempted to train the brain's electrical flow to work together rather than "flying" everywhere; which was our attempt to a non-drug treatment.</p> <p>Methods/Materials 60 potential ADHD subjects were evaluated to end up with 30 similarly controlled subjects. A wooden plaque with three colored cubes was created to serve as a cognitive training and the app BrainTap was installed to an electric device. Two types of testing were conducted. For the first test, training was done on the plaque and on device; and data was gathered by accuracy. For test 2, training was performed and data was collected by the accuracy of a quiz.</p> <p>Results The average score of Test 1 was 8.9 and the average of test 2 was 8.07 and difference of the averages was 0.83. A T-test was done to find a variance point of 2.821. 2 hypotheses were created, Null hypothesis, H_0, and H_a hypothesis, alternate hypothesis. The null hypothesis stated that the data points collected, will have a significance difference. H_a states that there isn't a significant difference. We failed to reject our null hypothesis by finding the P-value from the table. Meaning that there is a major difference between the points. Mathematically, Alfa (variable for the difference of averages, 2.821) was less than our P-value. To further secure our results, we did a confidence interval test. We found a 90% confidence in our results which means that cognitive training may be a treatment for ADHD patients.</p> <p>Conclusions/Discussion Our hypothesis was supported by our results that had a 90% accuracy. We infer that the both of training made our subjects think, be patient, and focus on the task in from of them. We believe the brain reacted to the training as something interesting and engaging. The frontal lobe, temporal lobe, hippocampus, and the basal ganglia were all working together to process the new information which were presented in both methods and worked together; which is crucial information as it suggests our hypothesis that cognitive training gives a boost to attention span in ADHD patients as it would with drugs/stimulants.</p>	
Summary Statement We contrived this study to show that Neuroplasticity is an effective and has the potential to be a non-drug treatment of ADHD.	
Help Received We contacted several doctors to end up Dr. Anita Hamilton of CHLA and Mr. James Le Bouf who both helped us evaluate the potential subjects. Our advisor, Rob Ickes helped develop out idea and looked over our data for errors.	



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

Name(s) Sohel Bagai	Project Number S0402
Project Title Fighting the Bullying Epidemic: The Effects of an Intervention Strategy on School-Aged Children with Speech Disabilities	
Abstract Objectives/Goals The objective of this study is to evaluate if speech-disabled children can identify positive traits in themselves and improve coping strategies with bullying. Methods/Materials Questionnaire, A Childrens book, The Stuttering Little Ballet Boy, written by Sohel Bagai, Human subjects medically diagnosed with speech disabilities. Ninety-two children with clinically diagnosed speech disabilities are given a baseline questionnaire asking to rate their experience of bullying. An intervention was done by reading a motivational book of a success story of a speech disabled child. The children are asked to identify something they thought they were really good at and asked to write this down. Then they were asked to think about their strength that they had written down at the next incidence of bullying that happened to them. One month later, they were asked to fill out the questionnaire again. No intervention with the book was done in the control group. Results I obtained the stress and coping scores of 92 students before the intervention and compared the same scores after the intervention using a paired "t-test". A comparison was also done in before and after studies in the control group. No significant difference was found in questions one through four on the experimental and control groups. A significant difference was found in the answers to the fifth question. The children felt less shy or nervous in talking to the other kids or adults after the intervention. Conclusions/Discussion I predicted that bullying will be less due to an increase in self-confidence. As a result of my research I could not conclude that bullying was less. The teachers reported that the children seemed to be more comfortable with talking about instances that happened and were having an open discussion with each other about it too. Identifying positive traits in ones own personality helps increase self-confidence and coping strategies with bullying.	
Summary Statement I tested and created a program based on the technique of self-empowerment and role-modeling to improve coping skills and reduce stress and anxiety in speech-disabled children who are frequently subjected to bullying by their peers.	
Help Received I designed my science fair project with the help of my science teacher, Mrs. Conrad, and my speech pathologist, Mrs. Erratt. I got help testing the children from the speech pathologists of the elementary schools of the Orange Unified School District.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Sophia L. Balkovski	Project Number S0403
Project Title Geographic or Linguistic Distance: Defining African Color Terms	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Basic color terms can be defined as words representing a wide set of hues, like "red" or "blue". Color terms differ from language to language. The goal of this project was to find out whether linguistic and/or geographic distances among African languages affected the differences among their color terms.</p> <p>Methods/Materials Data from the World Color Survey, which collected information on color term usage in 110 world languages, were analyzed using the Mathematica language. A quantitative methodology was used to compare color charts created from the data. Three types of distance were found between any two languages: geographic, linguistic (distance on a language tree) and chart (percent similarity of color terms). Linear regressions were made for each pair of the distances. The languages were then separated into two groups based the number of color terms they had, and the mean inter- and intra-group distances were compared for all distances. Both the chart and linguistic distances were used to reconstruct the geographical distance using multidimensional scaling.</p> <p>Results It was ultimately found that both linguistic and geographic distances have an effect on the way that color terms are used. The linear regressions for all distance pairs found them to be correlated with high statistical significance. Furthermore, for language-number groups, the average intra-group distances were smaller than the average inter-group distances, meaning that languages with similar numbers of color terms were close both linguistically and geographically. Surprisingly, it was possible to roughly predict the location of the languages based on color chip names, using multidimensional scaling.</p> <p>Conclusions/Discussion This project has been a study of African languages, but it can be applied in a much wider context. More languages and other linguistic features (e.g. syntactic structures) can be studied. This project is representative of using STEM methodology (mathematics and statistics) to study problems in human behavior. It is also a step closer to being able to mathematically represent the spread of culture between languages. With the expansion of globalization, it is becoming increasingly important to preserve Native American, African and Aboriginal cultures. The long-term goal is to create a model that could help design the best strategies to protect the diversity of these indigenous cultures.</p>	
Summary Statement I found a way to mathematically model the spread of culture, by looking at color terms in African Languages	
Help Received I discussed my ideas with a professor, and he suggested I use multidimensional scaling, which helped me further prove how correlated linguistic, geographic and chart distances were.	



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

Name(s) Ryan M. Beam	Project Number S0404
Project Title Can a Preventative Social Media User Interface Break "Fake News"?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this project is to determine whether in-product social media features can effectively reduce the spread of "fake news," or deliberately misleading information, on social media platforms.</p> <p>Methods/Materials Amazon Mechanical Turk account (used to acquire national sample group), Google Sheets, Graphing Calculator, Wix Account. Created three mock social media sites, identical in content, and applied a different type of preventative user interface to each, similar to those used by Facebook, Twitter. Tested how frequently disinformation was shared on each.</p> <p>Results 'User Interface 1,' which took no preventative measures and relied on users to check their own biases, was the least effective at mitigating the spread of fake news on the platform. 'User Interface 2,' which provided a Facebook-style warning icon on misleading posts, managed to keep fake news articles from going 'viral,' as they did on the UI 1, but failed to overcome confirmation bias. 'User Interface 3,' which implemented a Twitter-style sensitive content disclaimer overlaying misleading posts, most effectively kept individuals from sharing "fake news" articles on the platform.</p> <p>Conclusions/Discussion These results suggest that the most effective technique for mitigating the spread of fake news is to deliberately hide offending information. This is an expected result, and alongside it being a logistically daunting task to selectively censor millions of social media posts, the morality of implementing such an interface would certainly be debatable. The project does, however, reveal a more workable solution to the issue: while UI 2 may not have been as effective as UI 3 at keeping fake news articles from being shared, it was consistently as effective as UI 3 at keeping fake news articles from going viral. In other words, UI 2 allowed fake news articles to become slightly more popular than UI 3, but both consistently kept disinformation from breaching the popularity threshold and "going viral." Seeing as "fake news" articles are most dangerous when they reach high levels of popularity, it seems that UI 2's approach of Warning Icons, like the type Facebook implemented from 2016-2017, are sufficiently effective at mitigating the spread of fake news.</p>	
Summary Statement I examined whether in-product social media features can sufficiently deter individuals from sharing "fake news" online.	
Help Received None. I designed, built, and performed the experiment myself.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Jessica G. Bushman	Project Number S0405
Project Title The Extent and Effect of School Burnout on Adolescents	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to compare the extent and effect of school burnout on adolescents in high and low-income schools.</p> <p>Methods/Materials The study was conducted utilizing multiple measures. Following the receipt of a signed parental and participant consent form, students were screened for symptoms of school burnout. Once selected, parents and participants received a copy of the interview questions that were synthesized by the researcher, Ms. Jessica G. Bushman. Participants were interviewed in a 30-60 minute span of time, either by telephone or at a mutually agreeable time and neutral location. Upon completion of the interview, the participants later had an opportunity to participate in member checking of the interview transcript. In addition, Fifteen Title 1 schools, designated by the California Department of Education, were contacted. No schools responded allowing their students to participate. Past and present teachers, faculty, and staff at low-income schools were then contacted by email, online surveys, and in person. The data was then coded for anonymity and sorted into groups to reflect the most prominent findings and correlations.</p> <p>Results Students from low-income schools would not directly participate. Causes, symptoms, and student coping mechanisms, differed between high and low-income schools. Suggested interventions in high-income schools are based on improving the structure and organization, while suggested interventions in low-income schools are based on establishing structure and organization.</p> <p>Conclusions/Discussion Results help fill the gap in knowledge about the lack of research about school burnout in low-income schools. Moreover, the interventions may aid schools in intervening or preventing school burnout. Further research needs to be done on the subject looking at absenteeism, sickness-related absences, non-academic burnout at low-income schools, etc.</p>	
Summary Statement I compared the extent and effect of school burnout on adolescents in high and low-income schools.	
Help Received I conducted this study alone; however, I did my work in an independent study class at school overseen by Dr. Aidyl Gonzalez-Serrichio.	



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

Name(s) Kevin J. Chen	Project Number S0406
Project Title Perceptions and Decisions about Cheating: A Cross-Institutional Comparison	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The study investigates how high school students classify and evaluate personal cases of academic misconduct. The study also investigates how socioeconomic profile plays a role.</p> <p>Methods/Materials Participants were recruited from two high schools with distinct socioeconomic profiles, Mission San Jose High School (MSJ) and Watsonville High School (WAT). Participants were asked to (1) describe a past act of cheating or plagiarism, (2) explain their motivations for acting, and (3) evaluate the permissibility of their actions.</p> <p>Results Cheating and plagiarism were pervasive across both schools: 98% of participants self-reported an action that falls under our definition. 71% of MSJ participants evaluated their actions as not wrong, while 59% of WAT participants did so. Participants across both schools provided a wide variety of motivations and justifications for their actions and evaluations.</p> <p>Conclusions/Discussion Cheating is a common occurrence in high schools. MSJ participants commonly referenced the pervasiveness of cheating in school, suggesting a prevalent cheating culture. Students balance competing considerations in their evaluations, suggesting that their perspective on cheating is complicated. Teaching practices can incorporate these insights to reduce rates of cheating.</p>	
Summary Statement This project investigates the student perspective on academic misconduct through structured interviews with high school students about their personal experiences.	
Help Received I conducted the study in collaboration with a research group at UC Santa Cruz, supervised by Dr. Audun Dahl and PhD Student Talia Waltzer. The research group obtained university IRB approval. The design of this study was based on past studies conducted by this research group.	



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

Name(s) Leilani J. Corral	Project Number S0407
Project Title With or Without You	
Abstract Objectives/Goals The objective of this study is to determine if a person's gender and their biological parent's relationship status impacts their main focus. Methods/Materials 80 High schoolers (20 male with parents together; 20 male with separated parents; 20 female with parents together; and 20 female with separated parents) will be tested. There will be a paper of 10 drawings: 5 female-oriented images (emotional) and 5 male-oriented images (materialistic), which they'll be looking at for 15 seconds. Once time is up, they will write down 5 things they remember seeing without receiving any help. Results Between both genders, I have learned that there is no difference, and that many have remembered more female-oriented images. I assumed those with their parents together would focus more on male-oriented images since they already experience love and affection from having their families together. Conclusions/Discussion With this experiment, I have learned that a parent's relationship status does not determine what a child focuses more on.	
Summary Statement I found that males and females share a similarity on what they focus by being tested on memorization of female and male oriented images.	
Help Received None. I have decided on what images to use to test people. The high school students helped me gather data.	



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

Name(s) Khushali Desai; Pooja Desai; Aayushi Kapadia	Project Number S0408
Project Title The Power of Yet	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals In this experiment, we will compare growth vs. fixed mindset in Honor and CP level senior high school students and see if there is any effect of early class separation and gender on mindset scores.</p> <p>Methods/Materials Material: Pencil, Consent form, Mindset Quiz, 183 subjects - Senior High School students. Method: Mindset quiz was administered anonymously in the same classroom throughout the day. First informed consent obtained. Then each subject was handed the test by the teacher, and after all subjects completed, tests were collected by the teacher. The Tests were scored all together after everyone was tested. They were recorded in date tablet and represented in multiple graphs and significance tested using statistical tests.</p> <p>Results Early class separation according to academic level had effect on mindset scores. Gate students had higher scores than non-Gate students. Honors students had higher mindset scores than CP students. No significant difference in mindset scores of males and females.</p> <p>Conclusions/Discussion As stated in the result, Growth mindset is associated with higher academic performance.</p>	
Summary Statement In this experiment, we will compare growth vs. fixed mindset in Honors and CP level senior high school students and see if there is any effect of early class separation and gender on mindset scores.	
Help Received Mr. Valenti for administering the test in AP Anatomy/Physiology class and our parents for helping with the supplies.	



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

Name(s) Jessica S. Fairlie	Project Number S0409
Project Title From Data to Environmental Action	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to determine the best way to educate people about environmental issues so that they will want to participate in environmental activism.</p> <p>Methods/Materials Beach Cleanup Data from Save our Shores, posters, surveys. I analyzed the raw beach cleanup data in Microsoft Access by writing my own sql code to organize it by year. I then made posters using this data with different implied messages (positive, negative, and none). I wrote a survey asking people to sign up for a beach cleanup and compared the number that said yes for each type of poster.</p> <p>Results I found that showing people positive data had a higher percentage of volunteers than showing negative data. The difference between control and the positive was too small to be statistically significant.</p> <p>Conclusions/Discussion I found that showing people local, positive data had the best effect on motivating people to participate in environmental activism.</p>	
Summary Statement I found that showing local, positive information is the best way to motivate people into participating in environmental activism.	
Help Received Mat Miller at Save our shores gave me the raw beach cleanup data. I wrote the code and designed the posters and surveys myself	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Elias B. Gilbert	Project Number S0410
Project Title Gender's Role in Collaboration on a Logic Puzzle	
Abstract Objectives/Goals The objective of this study was to understand the factors that influence how effective a group is in performing a task. The main question in this study was about how the gender composition of a group affects group success and how people perceive their contributions to the group. Secondly, I studied how the amount that different people talk affects how well their group works together. Methods/Materials 42 students from the Santa Cruz High School Band, ages 14 to 18, each with signed informed consent forms, were randomly assigned into 14 groups of three to participate in the study. Students answered a survey about working in groups. Each group completed a band-related math puzzle challenge. I measured how often each person spoke, how many mistakes the group made when they did the puzzle and how long it took them to complete the task. Results The gender composition of a group had an effect on the effectiveness of the group. Groups with 2 girls and 1 boy were the most effective, groups with 1 girl and 2 boys were the least effective, and gender-pure groups performed about equally. Groups with a more even distribution of talking time were more effective. Males rated their success higher than females, while both genders were good at evaluating the their own contributions, those of others and the effectiveness of their groups. Conclusions/Discussion I found that the gender composition of a group and the amount that people talk are both factors in determining group effectiveness. Though my sample represents a very specific group of people, these results may apply to working groups of young adults in general, adding interesting knowledge to the important and developing field of social dynamics and team effectiveness. In the future, these types of results can be used to create more effective groups in education or in the workplace, and create strategies for integrating more women into working groups while maintaining or increasing their effectiveness.	
Summary Statement I found that how well a group solves a problem depends on its gender composition and the way people communicate.	
Help Received Prof. Rebecca London of the University of California Santa Cruz advised this project, helping with best practices for research and to clarify my ideas. Prof. Barbara Rogoff of UCSC also discussed my results with me. Christina Latham, the band teacher at Santa Cruz High School, allowed me to take students out	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Tommy Huang; Miranda Martinez	Project Number S0411
Project Title Perception of Information through Peripheral Vision	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The main purpose of the experiment was to explore the capability of males' and females' peripheral vision. This experiment was tested by two methods. In the first method, the researcher guided the visual attention of the subjects with a thumb to one side, meanwhile the other researcher displayed a word written on a notepad within the peripheral visual range of the subject for five seconds. In the second method, the subject follows the previous directions of the researcher while a colored note card was held in the subject's peripheral vision. Then the subject was asked to name a color. Overall, in the first test 47% of the male subjects were able to identify the word in their peripheral vision, whereas 67% of female subjects were able to identify the word presented. In the second test, 47% of males were able to name the color in their peripheral vision, and in contrast 80% of females were able to name the color. Comprehensively, there is a substantial difference in the capability of the peripheral vision between the two sexes.</p> <p>Methods/Materials For the first test, ask subject to read through given text and stand directly in front of researcher. One researcher extends left arm and instructs the subject to focus on the thumb for five seconds while covering their left eye. During the five seconds, the other researcher holds up notepad with a word within the subject's peripheral vision. Afterwards, instruct the subject to scan through the given text and inquire a word that stood out to them. For the second test, the subject is asked to follow the previous instructions while the researcher holds up a colored note card (red/blue). After five seconds, inquire the subject to name a color that comes to mind.</p> <p>Results In the first test 67% of females were able to identify the given word, while only 47% of men were able to do so. In the second test 80% of women distinguished the color on the note card, while only 47% of men did.</p> <p>Conclusions/Discussion The result of the experiment associates peripheral vision of human species with Evolution. Evolutionarily and historically, males played a bigger role as hunters and their visual focus has always been in the forward direction. On the other hand, females have had roles that required more peripheral vision and sensibility of their surroundings such as motherhood. In other words, Evolution favors females more in their trait of visually perceiving information in surroundings.</p>	
Summary Statement We tested the differences in capability peripheral vision between males and females.	
Help Received None. We designed, built, and performed the experiments by ourselves.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Raj Janardhan	Project Number S0412
Project Title The Effect of Music on the Brain Using Machine Learning	
Abstract Objectives/Goals Determine the effect of all genres of music on the frontal and temporal lobes. Methods/Materials Headphones. Laptop computer with an iOS simulator. Students took the test on the iOS simulator. I wrote the app, and the machine learning algorithm used, was Tensorflow, provided by Google. Results The results showed that only the genres of Blues, with an average score of 21.75 greater than the No Music average score of 20.25. Other than country, the other genres scored at least 3 points worse on average than without music. In the last two tests, an uptick in magnitude and tempo saw a decline in scores, while a decrease in magnitude and tempo had an average score that was .65 below the no music score. For the frontal lobe, Blues and Country enhanced brain competency. The other genres hindered the productivity. For the last two tests, a decrease in magnitude was close to no music averages and the increase in magnitude produced a decline. The temporal lobe saw Country and Blues show enhancement in brain competency, by a margin of .875 and 1.25 points respectively. The other genres showed detrimental impact, and a decrease in magnitude was detrimental to the temporal lobe. An increase in magnitude showed results equal to those without music. When the temporal lobe worked together with the frontal lobe, no music helped productivity. Pop, Blues, and Country had results similar to no music, while the remaining genres caused a negative impact. Changes in magnitude and tempo also resulted in a worse result than no music. Conclusions/Discussion The frontal lobe benefits highly from Country, Blues, and Jazz music. All of these types of music share the same melodic power with a slow rhythm and a low magnitude. With the frontal lobe, this allows an increase in dopamine, which increases focus, and does not take away from the power of certain synaptic connections. The temporal lobe benefits from Blues, Country and Jazz music. Similar to the frontal lobe, these types of music allow a faster synaptic connection. The music does not take away neurons that are focused on the task, while the rhythm and melodic power helps tone out other distractions. When the frontal and temporal lobe are working together, no music causes benefit as there are so many synaptic connections going on in the brain, that taking away some of these synaptic connections may result in a lack of concentration or a silly mistake.	
Summary Statement I realized that high schoolers' brain productivity is enhanced by music genres similar to Country and Blues, and are hindered by genres similar to Hip-Hop and EDM.	
Help Received None. I designed, implemented, and conducted all the testing for the software in the app I created.	



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

Name(s) Sreekar V. Kasturi	Project Number S0413
Project Title Emotions and Personalities	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My hypothesis is that people who listen to music that evoked happy, love, and peaceful emotions would be champions (ENFP), people who listen to sad music would be healers (INFP), and people who listen to courageous music would be dynamos (ESTP). My independent variables were emotions and gender and the dependent variable was the MBTI personality type.</p> <p>Methods/Materials Materials used: MBTI Personality Test and five two-minute medleys designed to evoke the following emotions: love, joy, sadness, courage, and peace.</p> <p>Results I found that the men who regularly listen to happy music, tend to think of themselves as champions (ENFP), whereas women associated with dynamo (ESTP) personality. Men who listen to peaceful music associated themselves with performer (ESFP) personality type and women associated with composer (ISFP) personality. Both genders who regularly listen to sad music associate themselves with healer (INFP) personality type, and courageous music with supervisors (ESTJ) personality</p> <p>Conclusions/Discussion I found that the male and female genders did not always agree on the personality types. For the happy emotion, both genders agree that they are extroverts, but disagree about which side of the brain they use. The women believe that they are sensors and thinkers, whereas the men were intuitive and feelers. When it came to peaceful emotion, both genders thought that they were sensors, feelers, and perceivers but disagreed on whether they were introverts or extroverts. This shows that for certain emotions, different parts of the brain were impacted for men and women. My research clearly demonstrates the impact of human emotions on personality types.</p>	
Summary Statement The cultivation of emotions using music in order to mould a personality.	
Help Received None	



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

Name(s) Chloe Little; Mohini Vadalia	Project Number S0414
Project Title Effect of Frequencies on the Human Brian's Memory Capacity: The Sound of Memory	
Objectives/Goals Discover and observe the impact of various frequencies upon the human memory capacity and effects upon concentration, cognition, and focus.	
Abstract	
Methods/Materials Materials: 7 Volunteers (within the age of 13-18) Frequency generator Enclosed area Simplistic images Timer Writing utensils Paper	
Method: Gathered 7 volunteers to test the effect of numerous tones and pitches of frequencies and discover the impact upon the memory and concentration of their brain.	
1.The 7 volunteers enter the area. 2.Show 1 image for 10 seconds without the use of a frequency. 3.Repeat step 2 for the next 4 images. 4.Allow 5 minutes for the volunteers to describe each of the 5 pictures from memory. 5.Repeat step 2,3,4 for the next 4 frequencies. (200, 3700, 11100, 15000) 6. Record the results of data.	
Results Our experiment showed that the 11,100 Hertz frequency was the most effective in enhancing the memory of our volunteers. After completing two trials, both trials showed that the points were, on average, the highest for the round of pictures shown while the 11100 Hertz frequency played, meaning that this session had the most details from participants, in both trials.	
Conclusions/Discussion To further this science experiment, as concluded in the results, the 11,100 Hertz frequency was the most beneficial for the participants to recall their memory, thus this can serve as a psycho-acoustic medicine to relieve stress pain or even aid the mentally ill in calming their breathing level and their active minds to a relaxed state or this can serve to prevent cancers or treat cancers and other diseases in certain situation. It can also increase memory functions, enhance sleep cycles and synchronize the left and right hemispheres	
Summary Statement The cognitive experiment explores the impact of different frequencies on the visual memory and concentration of a human, ultimately discovering that higher frequencies may serve as psycho-acoustic medicine for mentally disabled patients.	
Help Received The 7 volunteers tested upon in our experiment were our only assistance since my partner and I designed and performed the project ourselves.	



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Emma M. McVay	Project Number S0415
Project Title Do It for You: A Study of Correlations between Academic Performance and Intrinsic and Extrinsic Motivation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Previous research regarding the relationship between motivation and performance has found that extrinsic motivation (incentives supplied by sources external from oneself, such as rewards or parental attitudes) may cause anxiety or depression. Intrinsic motivation, in contrast, is self-motivation created through enjoyment of or sense of importance towards a task. This experiment was performed to find which category of motivation, extrinsic or intrinsic, is correlated to higher performance in an academic setting. It was hypothesized that intrinsic motivation would be associated with higher levels of academic success than extrinsic motivation.</p> <p>Methods/Materials Thirty-four fourth and fifth grade students completed questions on a survey that measured the participants' quantities of intrinsic and extrinsic motivation. The students' teachers supplied grade percentages from one quarter of the school year for each student. Levels of student motivation were totaled and compared to an average of each student's subject grades.</p> <p>Results The three correlations between fourth grade, fifth grade, and total levels of extrinsic motivation to academic performance were negative. Correlations between intrinsic motivation for these three samples to grades were positive, with the most significant being for fourth graders ($r=0.30$). "R-squared" values for these calculations, however, were extremely low (ranging from .0021 to .092), thus indicating very high variance levels in collected data.</p> <p>Conclusions/Discussion Although mathematically the results of this experiment did support the hypothesis because intrinsic motivation correlated to higher academic success than extrinsic motivation, variance levels were simply too high to make direct connections between variables. This may indicate for future research that different sources of motivation (rewards, personal enjoyment, etc.), both extrinsic and intrinsic, must be looked at individually alongside performance, as has been done in past studies.</p>	
Summary Statement Intrinsic and extrinsic motivational levels in fourth and fifth grade students were compared to student grades in order to assess correlations between motivational types and academic performance.	
Help Received Five elementary school teachers looked up and supplied school subject grades for each student participant to the experimenter.	



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

Name(s) Aditi Singh	Project Number S0416
Project Title Testing Von Restorff Effect in Long-Term Free Memory Recall	
Abstract Objectives/Goals The objective is to determine if a time gap between when information is learned and when the information needs to be recalled affects the human brain's ability to recall an isolated word (also known as the isolation effect). My hypothesis is that a time gap will not affect the human brain's ability to recall as isolated word because studies show that isolated words presented within a list of words have a higher probability of recall in a free recall test, so it's safe to predict that the isolation effect will also be successful in long-term memory. Methods/Materials The materials used in this experiment were a computer, a projector, paper, and pens/pencils. I tested a total of 90 participants during the experiment, in six different groups of 15 participants each. All groups were asked to look at a list of 20 words, watch a video (except the first/control group), and then try to write down as many words as they can remember after they've watched the video. The video presented had differing time lengths depending on the group (two to ten minutes among five groups). The list of words presented to the latter five groups had the eleventh word "story" presented in red font, to test the Von Restorff/isolation effect. Results After analyzing the data, only 27 percent of participants wrote down the isolated word in the control group. Groups 2, 4, and 6 had about 67 percent of participants write down the isolated word, while group 3 had about 73 percent of participants write down the isolated word and group 5 had about 87 percent of participants write it. The percentage of participants who wrote down the isolated word in all experimental groups was greater than the control group, and so we can conclude that a time gap (time of video) does not affect the brain's ability to recall an isolated word. Conclusions/Discussion My results from the experiment supported my hypothesis, as a time gap does not affect the brain's ability to recall an isolated word. Since we know the Von Restorff effect is actively used in long-term memory, this effect can be used to our advantage, especially for students in school in order to help them memorize certain pieces of information in order to better remember it.	
Summary Statement I tested the ability of the human memory to recall a certain piece of information based on physical stimuli present with the information, which in this case was words, in long-term memory.	
Help Received This experiment was conducted at my school, under my math teacher, Nora Beamon.	



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

Name(s) James D. Sunga	Project Number S0417
Project Title Illegal Immigrants and Crime: The Hard Statistics	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to explore the potential relationships between illegal immigrant population percentage and the seven types of crime rates collected by the FBI.</p> <p>Methods/Materials Laptop computer with the Piface & Microsoft Excel 2016 programs. The FBI's 2014 Urban Crime Statistics. The PEW Research Center's Estimates of Unauthorized Immigrant Population, by Metro Area, 2014.</p> <p>Results The mean murder rate, burglary rate, robbery rate, and aggravated assault rates did not significantly change whether or not illegal immigrants comprised a small (<5) or large (>5) percentage of the urban population. The mean rape rate, petty theft rate, and motor vehicle theft rate all significantly changed as illegal immigrants comprised an increasing percentage of population.</p> <p>Conclusions/Discussion As illegal immigrants increased from 0 to 10% of the population, reported rapes decreased by 38.08%, reported petty theft decreased by 18.8%, and reported motor vehicle thefts increased by 92.8%. It is not clear whether this is a reporting phenomenon or an incidence phenomenon (less crimes were reported vs. less crimes were actually occurring).</p>	
Summary Statement I found that as illegal immigrants comprised more and more of the population, reported rape decreased, reported petty theft decreased, and reported motor vehicle theft increased.	
Help Received I designed the statistical comparison after reviewing some statistics books and searching the technique on the internet. A local statistician and friend of my father reviewed the method and results.	



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

Name(s) Rhitishah Yuva Raju	Project Number S0418
Project Title Reducing Test Anxiety to Increase Academic Performance through Novel Breathing Techniques and Digital Visualization	
Abstract Objectives/Goals The goal of this project is to identify if high school students face test-taking anxiety and the best way to curb test-taking anxiety. Methods/Materials First, I identified if students have test-taking anxiety using statistical analysis through an online questionnaire comprised of 16 questions. Second, I established different experimental methods for curbing test-taking anxiety. The three different methods experimented with were: Deep Breathing, Patterned Alternate Breathing, and Digital Visualization. Results This study determined that a significant portion of high school students face test-taking anxiety. Overall, 41% of the 203 subjects studied had test-taking anxiety. Females at the age of 16 had the highest rate of test-taking anxiety at 67%. There were multiple countries studied. From this, USA had the greatest number of subjects facing test-taking anxiety and there was a large disparity between female and male test-taking anxiety level. However, in Malaysia, both males and females face almost the same amount of test-taking anxiety. Conclusions/Discussion My results have concluded that the portion of high school students facing test-taking anxiety is significant enough that it needs to be addressed in schools. The best method for curbing test-taking anxiety out of the three experimented with was Digital Visualization, however, all the three methods worked to reduce test-taking anxiety in every student. Digital Visualization was the best method because more senses are being tapped into to divert the brain from anxiety and into the relaxation exercise.	
Summary Statement My project identified that high school students do face test-taking anxiety and different relaxation methods can reduce their test-taking anxiety, specifically, Digital Visualization.	
Help Received My teachers provided a classroom environment for my experimentation.	