Name(s)

Chirag K. Akella

Project Number

J1201

Project Title

All About Allergies

Abstract

Objectives/Goals

The purpose of this research was to determine if there was a co-occurrence among allergies and asthma, if there was a certain age when people develop and outgrow allergies, and if there were geographic and genetic bases to allergies.

Methods/Materials

I created an anonymous, non-personally identifiable, survey on surveymonkey.com and a social campaign via Facebook and email to get hundreds of respondents from 14 countries. My data set included answers to 53 questions from 551 respondents. I analyzed my data using Microsoft Excel and computed the relevant metrics (e.g., co-occurrence, support, confidence, conditional probability, Pearson correlation coefficient).

Results

Food allergies, environmental allergies, and asthma co-occurred. Peanuts and tree nuts co-occurred the most among food allergies, pollen and grass co-occurred among environmental allergies, and asthma co-occurred most frequently with peanuts and pollen. The confidence data I computed shows, for example, that if anyone has one of the food allergies, they have a conditional probability of 66-84% of having peanut allergies as well. 21.6% of respondents outgrew their allergies by 11.4 years -- which is right around puberty. My data suggest a genetic basis to allergies for pollen and asthma (I did not have sufficient responses to determine the genetic basis for the other allergies). Finally, my results also showed that there is a geographic basis to allergies -- developed countries like the US and Canada show markedly higher allergy levels compared to a developing country like India.

Conclusions/Discussion

My data suggests that a number of food and environmental allergies and asthma co-occur -- across the globe. It also suggests that there is a geographic basis and a possible genetic basis to allergies. A possible explanation for the geographic difference can be the Hygiene Hypothesis.

The results from my work can be used in the real world. For example, my confidence data suggests that if the newborn is allergic to its mother's milk, there is 70+% chance they it will also be allergic to eggs and peanuts. Since dairy allergies are noticed early in life, doctors can guide parents to avoid these allergens. The same data can be used, later in life, to minimize the panel of painful skin prick tests. Also, my co-occurrence data can be used by chefs to design allergy-friendly menus and limit cross-contamination in kitchens.

Summary Statement

My project addresses the growing health concern around allergies -- and identifies age, co-occurrence, genetic and geographical trends from 551 respondents to a global survey that I ran.

Help Received

Mother helped explain Immunology concepts;Uncle and Aunt helped explain Math concepts; Dad helped with the survey and the board

Name(s)

Abdulkarim J. Alamad

Project Number

J1202

Project Title

Breastmilk + Baby = Autism? Debunking the Theory of Breastmilk as a Contributing Factor to Autism

Abstract

Objectives/Goals
This project was designed to debunk a study by neurologist Michael Merzenich at the University of California San Francisco linking breastmilk as a contributing factor to autism due to the amount of toxins present in breastmilk. My hypothesis states that breastmilk is not a contributing factor to autism. The study will prove that the percentage of breastfed children from the general public is more than that of children diagnosed with Autism.

Methods/Materials
The study consisted of two parts; one in Amman, Jordan, and another in Los Angeles County. A total of 160 surveys were filled by mothers of children ages 3-16, 80 from each location. 40 surveys were filled by mothers of children diagnosed with autism, and 40 were filled by mothers of children from the general public, not diagnosed with autism from each location. They were asked whether they exclusively breastfed, breastfed and formula fed, or exclusively formula fed their child for the first six months of life.

Results
The results showed that the percentage of breastfed children in both locations was higher in the general public than in autistic children. For the Amman, Jordan study, the general public were at 60% as opposed to 45% in children diagnosed with autism. For the Los Angeles County study, the general public were 52.5% as opposed to 30% in children diagnosed with autism.

Conclusions/Discussion
The hypothesis was supported by the results. The percentage of breastfed children in Amman, Jordan, and those in Los Angeles County from the general public was higher than the percentage of breastfed children in both locations diagnosed with Autism. Therefore, breast milk cannot be cited as a contributing factor to autism. The advantages of breast milk are too many to discard.

Summary Statement

Debunking the theory of breastmilk as a contributing factor to autism.

Help Received

Mother helped beautify the board; Mr. Mohammad Dalhoum Dr. Taqwa Khreasat for allowing me to survey their patients; Nancy Spiegel, Mrs. Ines Echegaray, and Mr. Carlos Velasco for advertizing my surveys to potential participants.

Name(s)	Project Number
Kellen J. Anielski	**J1203**

Project Title

Are 88 Keys the Key to Dexterity? Playing the Piano and Its Effects on Manual Dexterity

Abstract

Objectives/Goals
The objective of this experiment was to find out whether playing the piano increases one#s manual dexterity and if so, to find a numerical percentage of increase.

Methods/Materials
The experiment consisted of 25 piano players and 25 non-piano players who performed 3 timed tests involving the placement of screws in holes on a wooden board with their dominant and non-dominant hands.

Results
The averages of all times on the tests showed that on the first test, subjects who played piano completed the test 9.07% faster than those who did not play piano. On the second test, subjects who played piano completed the test 6.16% faster than those who did not. On the 3rd test however, it was found that those who did not play piano completed the test .62% faster than those who did. Using an average of all 3 tests, subjects who played piano exhibited an increase in dexterity of 5.25%.

Conclusions/Discussion
The results found from the data found showed that playing piano does increase manual dexterity. However the increase depends on the number of years a subject has played piano.

Summary Statement

This project was designed to find a difference in the manual dexterity of middle school students who did and did not play piano, and it was found that there was a 5.25% increase in the dexterity of piano players.

Help Received

Mrs. Elaine Gillum helped me gather test subjects and guided me through my project. My parents helped and supported me with editing, building the testing board and gathering testing materials. Mrs. Rachel Afualo mentored me for this project.

Name(s)	Project Number
Talia G. Bernstein	**J1204**

Project Title

Common Scents: A Comparison of Common Indoor Air Pollutants on Lung Function Measured by Peak Flow

Abstract

Objectives/Goals

The objective of my project is to determine what common indoor air pollutant has the most effect on people's lung function being measured by peak flow.

Methods/Materials

Informed consent was obtained from 16 participants.The participants ranged in ages from 13 to 14 years of age. Their peak flow was taken and they were then put in an environment with axe deodorant, sage smudge sticks, nag champa incense and scented candles. They stayed in that environment for one minute and then their peak flow was taken again. The pre and post numbers were recorded and compared.

Results

According to my participant's average peak flow readings, people had a negative 9.7% change when put in an environment with sage. This was the material that had the most effect on people's lung function. Incense had a negative 4% change. This was the material that had the least effect on people's lung function.

Conclusions/Discussion

My conclusion is that out of all the common indoor air pollutants, sage smudge sticks have the most effect on people's lung function and peak flow. It is also most detrimental to ones reparatory tract and lung health. Incense had the least effect on people's lung function and peak flow. It was also the least detrimental to ones health out of all the air pollutants.

Summary Statement

My project is a comparison of different, common indoor air pollutants and how they effect ones lung function and peak flow.

Help Received

Mother helped record peak flow readings

Name(s)	Project Number
Mahima S. Chillakanti	**J1205**

Project Title

Breathing Exercises and Lung Capacity

Abstract

Objectives/Goals

The objective of my project was to find out how different breathing exercises affect lung capacity. I got interested in this project because one of my family members had asthma and used a peak flow meter to measure his expiratory flow. This motivated me to learn more about the lungs and conduct this experiment. I hypothesized that Abdominal Breathing would increase lung capacity the most by strengthening the diaphragm to expand the lungs more.

Methods/Materials

To do this experiment, I identified five breathing exercises, gathered ten subjects, and measured their initial vital capacity, using a spirometer and the logger pro software. The exercises were done three times a day for five weeks. Twice a week I analyzed their change in vital capacity.

Results

The hypothesis was not supported. Pushing Out increased vital capacity the most, by 58.62%, because the subject deeply exhales and inhales, strengthening the lungs. Holding the breath in this exercise allows more time for the fresh inhaled air to mix in the air sacs and push out the stagnant air. Chair Breathing increased vital capacity by 30.74%. It includes chanting on the exhale, which slows down the breath, allowing the release of as much stagnant air as possible. In Chinese Breathing, which improved vital capacity by 26.8%, one inhales three times without exhaling, increasing the maximum amount of air inhaled. Abdominal Breathing increased vital capacity by 19.89% and inspiratory volume the most, by 103%, since the subject utilizes the diaphragm to take bigger inhales. Rib Stretch improved vital capacity by 12.92%.

Conclusions/Discussion

The results show that Pushing Out increased the lung capacity the most, Chair Breathing was second, Chinese Breathing was third, Abdominal Breathing was fourth, and Rib Stretch improved it the least. One can use these results to do a certain breathing exercise for improving specific lung volumes. It is important to have a high lung capacity. With a low lung capacity, the body will have less oxygen to function, less stamina, and a higher risk of a heart attack. This experiment is also useful for asthma patients who can do these exercises to efficiently take in more oxygen. If I were to do this project again, I would have more subjects doing more breathing exercises. I would also make the duration of the project much longer for more results and test other factors such as age, gender, and health conditions on lung capacity.

Summary Statement

Using a spirometer, ten test subjects, and the logger pro software, I discovered how different breathing exercises improve vital capacity.

Help Received

My father bought the spirometer and the software, and the test subjects sincerely performed the breathing exercises.

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Brenna L. Crow

Project Number

J1206

Project Title

Are Fingerprints Inherited?

Abstract

Objectives/Goals

The objective of my project is to determine if finger print patterns can be inherited. I believe that since every finger print is different, the patterns must be different too.

Methods/Materials

In this project I took 25 pairs of siblings, 25 pairs of non-related siblings, and 5 pairs of half related sibling's finger prints (a total of 110 subjects). I used an LEE Finger Print Pad to get my data. To get it I rolled their left index finger and thumb in the ink and placed it on a white sheet of paper which resulted in a clear finger print. Once I finished getting my test subjects prints, I created a chart that compared each pair of siblings. Then I wrote yes or no if they matched.

Results

In the end my data showed clearly that finger prints are inherited. As a control, I took random subjects and compared their finger prints. My data showed that 16 out of the 25 siblings matched, leaving 9 that didn't, and 7 out of the 25 non-related siblings matched, leaving 18 that didn#t. To be sure that my results were precise, I took 5 pairs of siblings that were half related. Their finger prints showed that they didn't match, which proves that you must have two sets of the same genes to inherit finger prints (have the same parents).

Conclusions/Discussion

My conclusion is that finger prints can be inherited. The 9 full siblings that did not match, I believe, have to do with one of the sibling's finger prints being inherited by one parent, and the other sibling inheriting the pattern from the other parent and /or the environmental conditions during pregnancy such as nutrition, blood pressure, position in the womb, and the growth rate of the fingers at the end of the first trimester.

Summary Statement

In this project, my goal was to prove if finger print patterns can be inherited between siblings.

Help Received

My mother drove me to collect subject finger prints.

Name(s)	Project Number
Irena L. Dezazzo	**J1207**

Project Title

Effects of Human Social Engagement Cues on Canine Responses

Abstract

Objectives/Goals

Behavioral scientists have recently begun testing canines for their ability to recognize simple forms of human social engagement cues, or body language. I wondered how dogs would respond in more complex tests and whether the responses might differ in pet dogs versus shelter dogs. To do this, my project focused on three potential cues: body orientation (body facing towards versus away from the dog); arm position (arms down versus arms crossed); and eye contact (open eyes versus closed eyes), using two human testers. I hypothesized that pet dogs would respond to cues favoring social interactions - body towards; arms down; and eyes open - but that shelter dogs, who might lack socialization skills, would not show as strong responses.

Methods/Materials

For each of the three cues, I performed 8 tests designed to evaluate the strength of the cue and to control for other variables. In total, I performed 960 tests on 20 pet dogs and 20 shelter dogs (40 dogs, 24 tests each). I videotaped all tests, later reviewed the footage and recorded the results in my binder.

Results

My results revealed all three cues were important in human-canine interactions, but the results differed for pet dogs versus shelter dogs. Body orientation was a strong cue for both pet and shelter dogs. 76% of pet dogs and 79% of shelter dogs chose the human facing towards rather than away from them. Arm position and eye contact were also strong cues in pet dogs, but these cues were weaker for shelter dogs: 83% of pet dogs and 57% of shelter dogs chose the human with arms down rather than crossed; 75% of pet dogs and 50% of shelter dogs chose the human with eyes open versus eyes closed.

Conclusions/Discussion

My findings show that both pet and shelter dogs have a strong preference for a person facing towards them. Pet dogs showed strong preferences in the other two tests, but shelter dogs did not, perhaps because they do not have as much human contact as pet dogs, and so are not as attuned to subtler human social cues. Shelter animals were often timid, and may have avoided looking at the human testers eyes and not noticed if they were open or closed.

My results imply that dogs often do understand and can respond to a variety of human social engagement cues. This information can be used to help train shelter dogs to respond more consistently, and to help people adopting shelter dogs to understand their limitations and training needs.

Summary Statement

My project tested the abilities of pet dogs versus shelter dogs to recognize and respond to forms of human social engagement cues.

Help Received

My mother drove me to the dogs, and acted as my assistant tester.

Name(s)	Project Number
Sahejvir S. Dhillon	**J1208**

Project Title

Blood Flow Rate Debate

Abstract

Objectives/Goals
Which factor will affect the blood flow rate (viscosity levels) the greatest: water, whole milk, or mango juice in both a 1/4 in. and 3/8 in. diameter of tubing? How will the diameter (1/4 in. or 3/8 in.) of tubing affect the time of flow rate in a system like the human body.

Methods/Materials
In my experiment, I drilled two holes with different diameters in the bucket. I used two different sized valves and pipes to compare the flow of three different liquids (i.e. water, whole milk, mango juice etc.) that had different viscosity's. I filled the bucket with the different liquids one at a time to the same level each time, and then I conducted the experiment. I used a stopwatch to keep track of the time it took to fill up half of a measuring cup in each trial. I did five trials with two different sizes of valves and repeated the same number of trials for each liquid. From the data collected, I analyzed the affect of size and viscosity on the flow rate of different liquids.

Results
My initial data consisted of four tables and four graphs. The exact values showed the 1/4 inch valve#s blood flow rate and the other two tables and graphs showed the 3/8 inch valve#s blood flow rate. The trends that occurred in each of the graphs were that the order of the liquids always kept constant and was always in the order, water, mango juice, whole milk. In the end the results of the experiment showed that the liquid water was the fastest to flow and the least dense and that the 3/8 inch valve made the liquids flow faster.

Conclusions/Discussion
My hypothesis for this experiment was that the size of the arteries and the thickness of blood affect the flow rate of the blood. I am going to use a home-made model of the cardiovascular system made from a 5 gal. Gallon plastic bucket with 1/4 in. tubing on one side and 3/8 in. tubing on the other side which will measure different times and the 1/4 in. tubing will take more time to fill 1/2 of the measuring cup while the 3/8 in. will take less time to fill 1/2 of the measuring cup. I also predicted that water will flow easier than my other variable, whole milk and mango juice. My trial examples and graphs thoroughly support my scientific guess. There were many hardships during my project, but I managed to pull through and finish great. In conclusion, that the bigger the diameter of the artery and the thinner the blood, the better the flow of blood is. Blood Flow Rate Debate!

Summary Statement

The different factors that affect the blood flow in the human circulatory system.

Help Received

Father helped with timing during experiment.

Name(s)	Project Number
Hannah Engel; Cassie Korb	**J1209**

Project Title

Pacing Pets: The Effect of Roaming Space on Distance Walked in Pets

Abstract

Objectives/Goals
Our main objective in doing this project is to spread awareness on pet obesity and get pets to lose weight, therefore giving them a better life without always being tired, and having trouble breathing because their weight is constricting their lungs.

Methods/Materials
Procedure: Buy 6 pedometers, Buy 6 Saddles, Buy collars , Put Saddles on 6 chickens, Hook the pedometers on the bottom of the chicken's saddles at 8AM , Put 3 of the chickens in an enclosed space, Put the other 3 chickens in an area where they can roam free, Leave pedometers on for 12 hours, Take off pedometers at 8PM, Record the number of steps that were taken, Put pedometers on chickens the following day at 8AM , Switch the chickens so that the ones that were enclosed now roam free and the ones that were let roam free are now enclosed, Leave pedometers on for 12 hours, Take the pedometers off at 8 PM, Record the number of steps that were taken, Put collars on cats , Put pedometers on cat's collars at 8AM, The repeat steps 6 through 15 with cats, Put collars on dogs, Put pedometers on dogs collars at 8 AM, Repeat step 6 through 15 with dogs, Put collars on goats, Put pedometers goats collars at 8 AM, Repeat steps 6 through 15 with goats.

Results
Every one of the 24 commonly owned mountain household pets took more steps and covered more distance in a 12 hour period if they were let roam free rather than being kept in an enclosed space. The goats took the most steps overall, covering the most distance, while in an enclosed and while they were let roam free. The chickens took the least amount of steps, and covered the least amount of distance. The results were amazing, every last one of them showing that animals will walk more if they are allowed an unlimited amount of space.

Conclusions/Discussion
Our hypothesis was correct, every one of the 24 chickens, dogs, cats, and goats that we tested took more steps if they were let roam free, rather than being restricted to an enclosed space. Goats took more steps in meters, this was because they were allowed the biggest roaming area on the roam free day, not being denied any space and were let roam for 10#s to 100#s of acres. This shows that if your pet is allowed an unlimited amount of roaming space, it will walk more and get more exercise.

Summary Statement

Our project is covering the subject of pet obesity through exercise, comparing the results distance covered and the number of steps taken in various 12 hour periods by common pets in mountain households.

Help Received

Science teacher helped explain written report process.

Name(s)	Project Number
Alex T. Fukunaga	**J1210**

Project Title

Carbon Dioxide, What a Waste! Changes in Carbon Dioxide Levels During Exercise in Boys and Girls

Abstract

Objectives/Goals
The objective is to measure the changes in exhaled carbon dioxide levels before and after exercise in boys and girls. My hypothesis is if carbon dioxide levels of five girls and five boys were measured before and after exercise, then the levels would be higher after exercise and that the boys would have higher levels than the girls.

Methods/Materials
Five girls and five boys ages 12-14 years old exhaled into cups of water at baseline and after push-ups, sit-ups and jumping jacks on three different days. The pH of the water was measured using a pH meter.

Results
Comparing the overall average pH levels for boys and girls, both groups lowered their pH levels from baseline to the end of the exercises. However, the girl subjects had a larger drop in pH levels (0.3) compared to only (0.1) for the boy subjects.

Conclusions/Discussion
After exercise, the average exhaled carbon dioxide level increased in both boys and girls which is consistent with my first hypothesis. A decrease in pH levels corresponds to an increase in acidity from the presence of carbon dioxide, which dissolves in water to form carbonic acid. However, the girls had a higher average carbon dioxide level at the end of the exercises than the boys which does not support my second hypothesis. These differences indicate that there could be other factors that influence exhaled carbon dioxide levels after exercise.

Summary Statement

The project studies the changes in exhaled carbon dioxide levels during exercise in boys and girls.

Help Received

Mother helped with purchase of supplies.

Name(s)	Project Number
Steven S. Higginbotham	**J1211**

Project Title

Impact of Gray Wolves on the Predator/Prey Relationship of the East Fork Winter Range

Abstract

Objectives/Goals

The project goal/objective was to investigate and research the impact of wolves on the predator/prey relationship of the East Fork Winter Range and to determine their affect on other wildlife species that inhabit the range.

Methods/Materials

I completed extensive field work (my entire summer) at the range and conducted interviews with specialists. I counted carcasses I found on the range and attempted to determine the predator involved. I tracked and observed wolves and other wildlife species that inhabit the range and surrounding areas. I used the follow equipment: radio telemetry device, GPS, compass, topographical maps, binoculars, digital camera and field notebook.

Results

I discovered wolves have dispersed elk throughout the winter range and surrounding areas. The carcass count helped to determine the geographic locations on the range in which wolves prey on elk most often. I observed many elk staying at lower elevations throughout summer and during the calving season as the wolves head to higher elevations. During my field study I observed a healthy population of scavengers which have benefited from the wolves presence.

Conclusions/Discussion

Wolves have had a significant impact on the East Fork Winter Range. They have dispersed the large population of elk that winter there and in surroundng areas. This has helped habitat such as riparian areas which are healthier as the elk must constantly be alert, aware and on the move due to wolf predation. Wolves have also dispersed the coyote population which had taken a large toll on pronghorn fawns. Now there is a greater survival rate of fawns. Scavengers have more available food sources due to wolf kills. The wolves have proven to be a positive presence in the ecosystem.

Summary Statement

My project is focused on the impact of wolves on the predator/prey relaionship on the East Fork Winter Range and their impact on other wildlife species that inhabit the range.

Help Received

Father helped type and tape board. Radio telemetry device used under the supervision of Wyoming Game and Fish Wolf Biologist

Name(s)	Project Number
Vivian L. Huennekens	**J1212**

Project Title

Can a Hamster be Guided through a Maze by a Specific Material that Indicates the Correct Path?

Abstract

Objectives/Goals
My objective was to learn if hamsters can be guided through a maze by a specific material that indicates the correct path.

Methods/Materials
I bought 4 hamsters, 4 cages and hamster supplies. I designed 5 mazes and my Dad and I built them out of wood. The design of the first maze was easy, but each maze after increased in difficulty for the hamsters. I layed yellow felt on the correct path and sandpaper on the wrong path. I thought it would be fun to call the yellow felt the "yellow brick road." I got this idea from the movie, "The Wizard of Oz." Just like the movie the felt leads to Emerald City. I put a picture of Emerald City at the end of the maze above the hamster treats. I made a customized chart to keep track of how many times the hamsters stepped off the felt and how long it took to complete the maze. We ran the hamsters through maze one 24 times. The purpose of maze 1 was to get the hamsters used to the idea of associating the felt as the correct path leading to the treat. Next, each hamster was run through maze 2, then maze 3 and then maze 4. This process repeated until the hamsters had run through each maze 7 times. Lastly, for maze 5, I tricked the hamsters by switching the materials around and laying the sandpaper on the correct path and the felt on the wrong path. I only ran the hamsters through this maze once. This was the real test to see if the hamsters knew to stay on the felt.

Results
I noticed that the personality of the hamster seemed to influence how they behaved and performed in the mazes. In maze 1, there was a decreasing trend in times and errors for Fred, Rhino, and Sparky, although Sparky did take a little longer to understand the concept. Most of Edward's times were very high. People might think he doesn't understand the concept, but he does show a decreasing trend in errors which shows that he does get it. In mazes 2,3, and 4 the hamsters did well. The real test was maze 5 where I tricked the hamsters by laying down the sandpaper on the correct path and the felt on the wrong path. Would the hamsters know to stay on the felt? The results were that 3/4 of the hamsters stayed on the felt.

Conclusions/Discussion
My results did support my objective and hypothesis. Hamsters are smart and can learn that a certain material will lead to a treat.

Summary Statement

Hamsters can learn that when presented with 2 different kinds of materials, only one will lead to the treats.

Help Received

Katherine Wentworth, vetranarian, signed vertebrate certification form & suggested a control maze. Monsa, PetSmart employee/hamster expert, talked about hamster care and supplies. My Dad helped me with the mazes and helped me create the graphs on the computer. My Mom bought the all materials, and

CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

Sameer U. Khan

Project Number

J1213

Project Title

Weight-Bearing or Not Weight-Bearing?

Abstract

Objectives/Goals

This project is designed to determine if a weight bearing device can be used in a regular MRI machine to mimic or resemble the effect of gravity on spinal anatomy as seen in the Upright MRI machine.

Methods/Materials

After getting consent from 15 subjects to participate in this project, their MRIs were scheduled at Vital Imaging Center in Bellflower, CA. Three methods of MRIs were taken of each subject: 1) Recumbent MRI with no compression, 2) Recumbent MRI with the Dynawell device, which increased the compression of the lumbar spine by 40% of the subjects' body weight and 3) A natural Upright position MRI, utilizing the Fonar Stand-Up machine. After the imaging, I gathered the data from the MRI tests and calculated the difference in sizes of the disc herniations between the 3 methods. I then used Microsoft Excel to graph the data and averages in order to show the results.

Results

In the 15 subjects tested, a total of 29 levels of disc herniations were seen. With the exception of 2 levels, all other recumbent (not loaded) method disc herniation measurements were either equal to or less than the loaded or Upright weight-bearing methods. Seven disc herniations measured higher on the Dynawell device (loaded) recumbent MRI compared to the Upright MRI method. Twenty-one disc herniations measured higher on the Upright MRI method in comparison to the Dynawell device (loaded) method. One level was equal. The average disc measurements for the recumbent (not loaded), loaded and Upright methods were 2.2mm, 2.79mm, and 2.88mm respectively. In comparison to the recumbent (not loaded) method, the average disc herniation was 26.6% higher int he Dynawell (loaded) method and 30.8% higher in the Upright MRI method. There is only a 4.2% differential between the loaded and Upright MRI methods.

Conclusions/Discussion

Studies have shown that the true extent of a back injury is better visualized with weight-bearing conditions compared to not weight bearing conditions. This leads to more accurate treatment planning and outcomes for patients. When an Upright MRI machine is too expensive or not available, an external loading device such as Dynawell is a good alternative to produce results closer to natural weight-bearing. This leads to greater accessibility, more accurate diagnoses, and better treatment planning for back injury patients.

Summary Statement

This project is designed to determine if a weight bearing device can be used in a regular MRI machine to mimic or resemble the effect of gravity on spinal anatomy as seen in the Upright MRI machine.

Help Received

Name(s)	Project Number
Tessa N. Lane	**J1214**

Project Title

Dancers Under Pressure

Abstract

Objectives/Goals
My objective was to determine if younger or older dancers put more pressure on their feet when they dance.

Methods/Materials
I obtained 30 informed consent forms for dancers of various ages at my dance school. The materials that I used to measure these participants were a tape measure to measure the dancers height, a bathroom scale to measure the dancers weight, corn starch and clay placed in trays for the dancers to step into. After measuring the participants height and weight, I asked them to step into the tray with the corn starch first and then into the tray with clay. The corn starch helped to prevent the clay from sticking to the dancers feet. I had the dancers stand in fifth position in both plie and releve and took pictures on both of these impressions. I then took these photos, uploaded them to a computer and used Photoshop to pixilate them and convert the pixilated area into cm2. I entered that data into an Excel spreadsheet and used the data to find the pressure in kilopascals.

Results
My data showed no correlation between the age of the dancers and the pressure on their feet.

Conclusions/Discussion
My results did not support my hypothesis. I believe that this topic may support further testing though. While age, height, and weight did not appear to be correlated to the pressure on the participants feet, perhaps a larger study could be used to find some pattern. Dancers, as well as women in heels, put many pounds of pressure on their feet everyday and if a correlation could be found perhaps dance shoes and heels could be made to help alleviate some of this pressure.

Summary Statement

My project is about how much pressure dancers might put on their feet.

Help Received

Mother helped purchase supplies, drove to and from dance class, assisted in gathering data. Father helped upload photos onto computer and into Photoshop , helped me find the needed formulas, and helped enter data into Excel.

Name(s)	Project Number
Brooke E. Leonard	**J1215**

Project Title

Horse's Choice: Do Horses Have a Color Preference?

Abstract

Objectives/Goals
It has been documented that horses are capable of seeing color. If that is the case, then would a horse have a color preference for the food box that they eat from?

Methods/Materials
Five horses, 4 different color boxes, Oats/feed. For my method I placed the 4 color boxes in the arena where I would bring a horse to and allow them to select which box to find their food. All the boxes had the same feed and I switched the location of the color boxes each time so that I could eliminate a location preference. I used 5 different horses and did 5 tests for each horse for a total of 25 experiments over a 5 week time period.

Results
I made a hypothesis that yellow would be the most preferred color box the horses would go to because Yellow is a color horses do not often see and it's a non-threatening color. The results supported my hypothesis.

Conclusions/Discussion
Yellow is a favorite color for the horses I tested. I would enjoy doing this project on a much larger scale with many varieties of horses. Knowing a horses favorite color could enable veterinarians to color code medicine so the horse would be more willing to taking it.

Summary Statement

Testing whether or not horses have a color preference and if so how to use that to aid veterinarians and trainers.

Help Received

Mom helped record, Joelene Dunlop at B&B stables allowed me access to the horses

Name(s)	Project Number
Samuel J. Lin	**J1216**

Project Title

Can You Hear Me Now?

Abstract

Objectives/Goals

The goal of this auditory study is to evaluate three listening devices to determine which among them creates the highest decibel and vibration levels; thus having the most potential to cause auditory damage.

Methods/Materials

Materials:

Pink silicon ear, plastic tubing, dB meter, iPhone 4S, Pair of ear buds, Set of headphones, Pair of iPhone 4S external speakers, Ruler, Bottle of silicon glue, Different types of polyvinylchloride piping, Different types of plastic funnels, Plastic cup, Pair of scissors, Candle lighter, Broom stick, Bass speakers, Container of salt, Bag of small, black balloons, Bag of large, black balloons, Silver marker, Tripods, Bag of rubber bands, 2x4 Lego piece, Salt Crystals

Methods:

I. After preparations for dB test. A. Ear buds. 1. Plugged ear bud into the ear canal of silicon ear. 2. Played Rock and Roll music 10x for 30s each time and record data. 3. Played Pop music 10x for 30s each time and record data. 4. Played Classical music 10x for 30s each time and record data. B. Headphones. 1. Attached headphone onto the auricle of silicon ear. 2. Proceeded with same steps as steps 2 # 4 in ear bud testing. C. External Speakers. 1. Placed speaker 6 inches away from silicon ear. 2. Proceeded with same steps as steps 2 # 4 in ear bud testing.

*I could not fit the second half of my procedure because of character limits. It included Vibration Testing.

Results

The highest decibel(dB) levels that the ear bud reached were 101.5 dB. The highest dB levels that the headphone reached was 97.5 dB. The highest dB levels the external speakers reached was 91 dB.
The highest displacement distance that the ear bud reached was 6 mm. The highest displacement distance that the headphone reached was 1.5 mm. The highest displacement distance that the external speaker reached was 0 mm.

Conclusions/Discussion

The results of the testing revealed that the hypothesis was correct: that the ear buds had the highest levels of dB and vibrations, therefore having the most potential to cause auditory damage. If you compare the data on the graphs, the ear bud's graph is significantly higher in decibel and vibration level while the other graphs are much lower.

Summary Statement

My project is a comparison between three listening devices--ear bud, headphone, and speakers--to see which one has the highest decibel and vibration levels therefore having the highest potential to cause auditory damage.

Help Received

Father helped construct framework of project; Mother helped with the color scheme.

Name(s)	Project Number
Bailee A. Poole	**J1217**

Project Title

Investigating if Bathing a Horse after Exercise Affects the Horse's Heart Rate

Abstract

Objectives/Goals
The purpose of my science project is to investigate if bathing a horse after exercise affects the horse's heart rate.

Methods/Materials
Disk arena with tractor each day before experiment. Groom the horse. (Brush, pick hooves, etc.) Put the saddle, the splint boots, the bell boots, and the bridle on the horse. Take the horse's heart rate with the stethoscope while the horse is at a rest. Record the number of beats per minute each time after taking the horse's heart rate. Warm up the horse for five minutes. (Beginning with walking the horse, proceed to trotting and then loping the horse in both directions around the arena.) Lope the barrel pattern. Let the horse rest for 5 minutes. Take the horse's heart rate. Warm up the horse again for five minutes.
Run the barrel pattern again. Unsaddle the horse. Bathe the horse for 5 minutes. After bathing the horse, take the horse's heart rate. Repeat the procedure ten times.

Results
Bathing a horse after exercise helps to decrease the horse's heart rate.

Conclusions/Discussion
After completing my investigation I found that after exercising the horse, bathing the horse decreased the horse's heart rate.

Summary Statement

To investigate if bathing a horse after exercise affects the horse's heart rate.

Help Received

Supervised by Dr. Troy S Ford,Doctor of Veterinary Medicine & Equine Surgeon. Mom helped cut and glue board.

Name(s)
Rileigh E. Pot

Project Number

J1218

Project Title

Degradation of Hair Strength over Time

Abstract

Objectives/Goals
For this project, I tested whether or not hair got weaker over time by testing the amount of weight a top shaft of hair would hold verses the bottom shaft of the same hair. I thought the hair would get weaker over time. This is because split ends start at the end of the hair shaft. There is also the factor that a big part of the material in your hair is keratin and I thought that, as the shaft of hair got older, the keratin would start to degrade.

Methods/Materials
First, I built the "Ri2013", which is a device with clamps and a weight pan that tests the tensile strength of hair. Then I created sample sheets and data sheets which obtained important information about the subject and held the hair that I collected. It also was a place where I recorded my results. Finally, I tested the hair by cutting the shaft in two and adding weight to see how much it could hold.

Results
The results I found were almost as I expected from my hypothesis. Six of the seven subjects had hair that was stronger at the top than at the bottom. However, there was one outlier that had hair that was stronger at the bottom than at the top. I do happen to know that this subject had repeated damaging hair treatments, such as bleach and dye.

Conclusions/Discussion
Although I did have one outlier, I found that usually hair is stronger at the top of the shaft than the bottom of the shaft. I was very interested to see that the subjects with dark hair had significantly stronger tensile strength. I did not look at the genetics, hair treatments, shampoos, etc., because I felt like sticking to one variable. In this case, top verses bottom. In the future, I would like to see if dark hair is stronger than light hair.

Summary Statement
To test if the top of a human hair is stronger than the bottom shaft of a human hair.

Help Received
Mother helped type report but all words were mine, as per IEP.

Name(s)	Project Number
Ashwath M. Radhachandran	**J1219**

Project Title

To Stress or Not to Stress: The Effect of Stress from Academic Exams on Pulse Rate and SpO2

Abstract

Objectives/Goals
The objective of this project was to observe whether or not stress from academic exams had an effect on the pulse rate and blood oxygen level of students (SpO2). It was hypothesized that stress from academic exams would increase students pulse rate by 20 beats per minute. Previous experiments show that exercise or physical stress can affect pulse rate. Therefore, mental stress should also have an affect on pulse rate. In contrast, stress was hypothesized to have no observable effect on students' SpO2. Blood oxygen levels typically do not have drastic changes.

Methods/Materials
In this project four different classes were tested: math, Spanish, science and history. Two different sets of data were collected in each class. The control set was 3 SpO2 and pulse rate readings and the second set was collected before and after exams. During an exam in any class, students took pulse and SpO2 readings before and after the exam.

Results
Standard deviation and overall averages of all readings were calculated. Averages were calculated for all control readings, readings before exams and after exams. The average for all the control pulse rates was 80 beats per minute (bpm), the average for pulse rates before exams was 91 bpm and the average for pulse rates after exams was 82 bpm. The change in pulse rate before and after exams was 9 bpm with a standard deviation of 15. The standard deviation among the differences is high, but it can at least be said the pulse rates of some students were affected by stress. SpO2 on the other hand had no observable change as hypothesized.

Conclusions/Discussion
The results showed that stress had an affect on pulse rate, but no observable affect on SpO2. Stress is a common feeling that students experience when taking exams during school. The education system is constantly trying to improve teaching methods and students' ability to perform on exams. The first step to achieving this is by detecting and reducing stress that students may experience during exams. This project's goal was achieved because it detected that some students faced stress during exams.

Summary Statement

This experiment tested the change in blood oxygen and pulse rate of students before and after exams in four different classes.

Help Received

Thank you to my mentor Mr. Rajeev Rajan who provided me with equipment and thanks to Mrs. Gillum who guided me through the project. Thanks to the companies Nonin and SpoMedical that also contributed pulse oximeters to help me conduct my experiment. Lastly thanks to my test subjects that participated in

Name(s)	**Project Number**
William T. Rosenthal	**J1220**

Project Title

Dog Training: The Effectiveness of Various Training Methods on Service Dogs

Abstract

Objectives/Goals
The objective is to determine which cue among the spoken word, signed word, written word or visual picture produces the most efficient method of training a service dog to respond to a person with disabilities when that person gives a command to have an object retrieved.

Methods/Materials
Method - using the following subjects/materials in a controlled setting to gauge response effectiveness.
Materials -
1) Four different dogs were used (3 Labrador Retrievers/1 Golden Retriever)
2) Three different pictures were used (key, hat, shoe - enlarged on white paper)
3) Three different written words were used (eyeglasses, book, towel -enlarged on white paper)
4) Twelve different objects were used (keys, hat, shoe, eyeglasses, book, towel, newspaper, Rx bottle, wallet, leash, food dish, socks)

Results
The dogs (test subjects) reacted best to the most simple/least distracting methods of training; the spoken word and the signed word. Nevertheless, the dogs were also able to learn the commands through the cues of the written words and pictures (with a steeper learning curve than training with the spoken word and signed word).

Conclusions/Discussion
When training service dogs with spoken words, signed words, written words or visual pictures, spoken words and signed words were the methods to which all subject dogs best responded; however, the subject dogs were able to learn all four methods.

Summary Statement

My project deals with discovering the best methods by which to train service dogs to perform useful functions to assist persons with disabilities.

Help Received

My parents assisted in driving the subject dogs between their homes and my garage/test area.

Name(s)	Project Number
Therese A. Santiago	**J1221**

Project Title

The Effects of Exercise on Sleep Quality

Abstract

Objectives/Goals

The objective of this project is to determine if an increased amount of physical activity affects sleep quality. I hypothesized that increased calories burned will improve sleep quality with increased length of sleep and decreased movement. Studies have shown that exercise helps improves sleep quality in adults, while some have shown that exercise has no clear effect on sleep quality. However, there are only a few studies done on adolescents. To my knowledge, there have been no previous studies establishing the correlation between the amount of calories burned as a determinant of physical activity and sleep quality.

Methods/Materials

After signed consent from the parents, subjects were asked to wear the BodyMedia FIT# armband (by BodyMedia, Inc. Pittsburg, PA) on their left upper arm for 4 days and nights, except during bath. They were instructed to increase their activity level for 2 of the days. The other 2 days, they were asked to have minimal activity. After the test, they answered a questionnaire regarding the type and length of the exercise and perceived sleep quality. Data from the armband was downloaded through the BodyMedia website included the following: calories burned/day, sleep efficiency, movement in sleep and sleep duration. The highest and lowest values for the amount of calories burned per day were analyzed.

Results

There were 25 participants whose ages ranged from 11- 16 years old (mean age 13). 62% of the subjects had increased sleep efficiency with less exercise. 57% of the subjects had decreased sleep movement and increased duration of sleep with less exercise. 71% of the participants felt like they slept better with more exercise.

Conclusions/Discussion

The results of this study did not show improved sleep quality with increased exercise. This is opposite of my hypothesis: increased activity will improve sleep quality. However, this is consistent with some published articles in adult population that failed to show clear effects of exercise on sleep. The survey filled out by the participants showed subjective improvement in the sleep of 71% of the subjects with increased exercise, despite the recorded sleep quality. The perceived improvement of sleep after exercise could be attributed to the well feeling associated with exercise. Sleep is important in keeping adolescents healthy. It is important to establish with certainty how exercise can affect sleep.

Summary Statement

This test shows that there may be no clear effect of exercise on sleep quality.

Help Received

My parents helped arrange my board.

Name(s)	**Project Number**
Jasmine M. Shapiro	**J1222**

Project Title

Fingerprints: Similarities in Families

Abstract

Objectives/Goals

The objective was to find out if fingerprints have more of a correlation between parents and their children or siblings and each other.
Hypothesis:
They are more similar between siblings because of the greater DNA similarity

Methods/Materials

The first step is to ensure that you have all materials. Then you must enlist 20-25 families with at least 2 children. Each of those families must sign a permission form. The experimenter must open the ink pad, roll the subjects right and left index fingers onto the ink pad, and then roll the fingers on the paper. The experimenter then must write the subject's code (number code for family, and letter code for members) next to his/her fingerprints. Then, you must look for similar patterns and distinguishing characteristics. After fingerprinting members of all families, determine how many of the children's fingerprints are more similar to their parents' and how many are more similar to their siblings. Draw a conclusion from the experiment stating if your hypothesis is correct or incorrect. Lastly, at the end of all experiments fingerprints will be shredded, so that you aren't keeping any other peoples' personal information.
Materials: 1 Lee Fingerprint Ink Pad, Magnifying glass, Wipes, White paper, Permission forms.

Results

24 families were tested all of which consisted of a mother a father and between two and four children. 11 people had the same similarity to their parents as their siblings.15 people had more similarity to their parents than their siblings. 27 people had more of a similarity to siblings than parents. I also wanted to see if it was a matter of gender. For example, if a son had more of a similar fingerprint to his father than his mother. 9 people proved that it was a matter of gender, and 3 people showed no correlation.

Conclusions/Discussion

After examining the data, it proved my hypothesis correct. There was more of a similarity between siblings than between parents are their children. The reason I came up with this hypothesis is because siblings share more of the same DNA with each other. Some siblings might have more DNA and similarity to one parent than the other, when siblings share DNA from both parents. Although this was not part of my hypothesis, after seeing patterns in my data, I was able to tell that it was also a matter of gender.

Summary Statement

My project is about fingerprints and whether there is more of a similarity between parents and their children and siblings and each other.

Help Received

Parents helped drive to homes; Subjects provided data for project; Teacher provided guidance; Police Officer answered interview questions

Name(s)	Project Number
Brooklyn A. Snyder	**J1223**

Project Title

Magnitude of Vocal Ranges

Abstract

Objectives/Goals
The object of my project was to determine whether age and/or gender of a trained singer affects the range of notes they can sing clearly. If age and/or gender of a trained singer impacts the number of notes he/she can sing clearly, then adult females will be able to sing the largest spectrum of notes.

Methods/Materials
90 singers, (15 males and females in the ages of eight years old, Jr. High, and adult) were tested. On a piano or keyboard, play C4 (middle C) and have the singer repeat the note. Continue playing the white keys with a lower pitch until singer can't sing note clearly. This is the bottom of the singers vocal range. Return to C4 (middle C) and play the white keys with a higher pitch until the singer can't sing note clearly. This is the top of their vocal range. To find the magnitude of the singer#s range, count the number of notes in the singer#s vocal range.

Results
Increasing age appears to broaden vocal ranges within a gender, with the biggest variation in the female test subjects (an increase of five notes in each age range). Vocal ranges for male subjects seem to increase with age but level off after puberty (an increase of five notes between eight year olds and Jr. High students).

Conclusions/Discussion
In conclusion, age and gender of a trained singer do affect the magnitude of their vocal range.

Summary Statement

My project measures the magnitude of vocal range and the changes between various age groups and genders.

Help Received

Young Singers Club, Santa Barbara Choral Society, Santa Barbara's Childrens Choir, and Riverside Magnolia Baptist Church provided test subjects

Name(s)

Andrew Jon Valadez

Project Number

J1224

Project Title

Tea Time: The Effect of Tea on Blood Pressure

Abstract

Objectives/Goals
This project is meant to find out if drinking peppermint tea or chamomile tea can lower blood pressure.

Methods/Materials
First I asked each potential subject if they would like to participate in my study. If they agreed, I had them randomly select a slip of paper out of a cap to determine the order of the teas they would drink.(The papers were labeled 1=No tea, 2=Peppermint tea, and 3=Chamomile tea.) On the day of each test, I gave the subject a pre-survey to make sure they hadn't eaten recently and to determine their overall level of well-being before beginning the test. If the subject qualified for participation, I would continue with the test. First, I measured the test subject's blood pressure with a battery powered blood pressure reader, and recorded the numbers. After reading their blood pressure the first time, I gave them 8oz of tea and 5 minutes to completely consume the tea, or just wait if they received no tea for that day. When the 5 minutes were up, I waited another minute for the tea to have a chance to take effect. After the minute I measured the subject's blood pressure using the same blood pressure reader and recorded the data.

Results
Results of the experiment show that peppermint tea can lower blood pressure more than chamomile and no tea. The mean change for peppermint tea was a decrease of -3.67 mm Hg(systolic)/-5.89 mm Hg(diastolic)compared with the means of chamomile tea which scored an increase of +3.75 mm Hg (systolic)/ 0.125 mm Hg(diastolic) and no tea which had mixed results with a decrease of -0.13(systolic)/ +3.3(diastolic.

Conclusions/Discussion
Results of this experiment disagree with my hypothesis because I thought drinking chamomile tea would have the greatest effect on blood pressure. In the future students may want to look at the effect of drinking different types of tea on mood.

Summary Statement

This project is meant to find if, and which type of tea can lower blood pressure.

Help Received

Name(s)	Project Number
Jennifer A. Yao	**J1225**

Project Title

Beat Parkinson's! A Study of Correlations between Dietary Habits and Weak Organs Associated with Parkinson's Disease

Abstract

Objectives/Goals

My grandfather was diagnosed with Parkinson#s disease ten years ago. Over time, his movement and coordination was greatly affected by this disorder. Watching his ability to enjoy life#s simple pleasures slowly deteriorate, I was deeply saddened. I hope to find the causes and risk factors associated with Parkinson#s in order to help people know if they are at risk.

This study is conducted on the two possible risk factors: dietary habits and the weakness of organs. The hypotheses of this project are: If Parkinson#s patients have more intake of meat than those in the control group, then meat intake has a correlation with Parkinson#s, and, If the majority of the Parkinson#s patients have the same weak organ according to the TCPD (Traditional Chinese Pulse Diagnosis), then the organ health correlates with Parkinson#s disease.

Methods/Materials

Computers

Patients who have Parkinson#s Disease and are above the age of 44 years (experimental)*

Patients without Parkinson#s Disease above the age of 44 (control)

Survey (20 questions) for Parkinson#s patients with QuestionPro

Survey (18 questions) for non-Parkinson#s patients with QuestionPro

Chinese Medicine doctor

Agreement to Medical Diagnosis form

Results

The average consumption of meat in the Parkinson#s group is slightly lower than the control group. Through results of the Traditional Chinese Pulse Diagnosis, there is enough evidence to suggest a possible correlation between Parkinson#s disease and the weak organs (liver).

Conclusions/Discussion

There is no significant difference on the consumption of meat between the two groups to prove that there is a correlation between Parkinson#s and meat intake.

7 out of 8 patients has liver as one of their weak organs. There is a 90% of probability that liver may be the weak organ among Parkinson#s patients.

My research demonstrates that there#s a correlation between Parkinson#s disease and the liver.

Liver may be used as an early detector for Parkinson#s using TCPD.

Summary Statement

This study analyzes the possible risk factors (dietary habits and organs) associated with Parkinson's disease through surveys and innovative methods such as the Traditional Chinese Pulse Diagnosis.

Help Received

Name(s)

Olivia Chang

Project Number

J1297

Project Title

Do Boys or Girls Have a Faster Physical Reaction?

Abstract

Objectives/Goals
The objective is to determine whether boys or girls have a faster physical reaction.

Methods/Materials
An index card was used to measure the one-inch distance between every subject#s hand. A ruler was placed three inches above the subject#s hand and dropped at a random time. Where the subject caught the ruler was written down in a logbook that had their name and gender. This procedure was repeated 20 times with ten girls and ten boys.

Results
Based on where the subject caught it, they were placed into one of three categories for their gender. The categories were fast reaction, average reaction, and slow reaction. Girls had one fast reaction, four average reactions, and five slow reactions. Boys had one fast reaction, three average reactions, and six slow reactions.

Conclusions/Discussion
Boys and girls have always been separated based on physical abilities, boys being "faster" and "physically stronger." However, girls have a faster physical reaction.

Summary Statement

Analyzing where subjects caught a ruler determined which gender had a faster physical reaction.

Help Received

Mother helped print out board background;

Name(s)	Project Number
Grace M. Resnik	**J1298**

Project Title

Get the Red Out!

Abstract

Objectives/Goals
The purpose of my experiment was to determine if people with lighter colored eyes get red-eye more frequently than people with darker colored eyes. I believe that if the pupil diameter is larger, then the relative red-eye will be greater; if the eye color is lighter then the relative red-eye will be greater and if the subject's age is lower (16 and under) then the frequency of red-eye will be greater.

Methods/Materials
Pen/pencil, camera, charger, printer, computer, lined paper, notebook, metric ruler, meter stick, labels.

Take photographs of 25 subjects' eyes. Measure pupil diameter indoors and outdoors. Take photos outside between 4:15 and 5:00 p.m. Inside photos will be taken with bright light and dim light. Print photos and record results. Chart results based on eye color, pupil diameter and age.

Results
The data supports my hypothesis that lighter colored eyes have a greater amount of relative red eye than brown colored eyes. 46% of the subjects that had red-eye had light eyes. Only 13% of the brown eyed subjects had any red-eye present. While pupil diameter does play a role in the amount of relative red eye, the results were not consistent enough to support my hypothesis in this area. All red-eye was present in pupils at a diameter of 4mm or higher, but not all large pupils had red-eye. Lastly, it was not able to be determined if age plays a role in the frequency of red-eye found in younger participants. The results for the younger group and older group were equal. Relative red-eye was only present in photos taken indoors, with dim lighting conditions.

Conclusions/Discussion
Pupil diameter affects the Relative red-eye number, but the results are inconsistent. Most red-eye did occur at large pupil diameters, but not all large pupils had red eye. This was true for both light and dark colored eyes. My results did not prove that age affects red-eye. Both young and old subjects had equal amounts of red-eye. Overall, more participants with light colored eyes had instances of relative red eye than brown eyed participants. In support of my hypothesis, higher numbers of relative red-eye were recorded for light colored eyes. Location did not play a role in my results, as no photos taken outside had any presence of red-eye. The amount of light had a direct effect on pupil diameter, therefore all instances of red-eye occurred in the photos taken inside, under dim light.

Summary Statement
My project evaluates the frequency of red-eye in photographs based on eye color, age and the level of light available.

Help Received
I had someone hold the metric ruler while I took the photographs.

Name(s)	Project Number
Taryn Clark	**J1299**

Project Title

Grip This Hand! Hand Position Impacts Strength

Abstract

Objectives/Goals
This project examines hand position and how it affects grip strength and muscle fatigue with repetative motion.

Methods/Materials
I used a Jamar hand dynamometer to measure grip strength in a neutral, supinated, and pronated position. Each position was tested multiple times in a rotating order.

Results
I found that 59% had the strongest grip strength in the neutral position, 34% in the supinated, and 4.5% in the pronated positions. There appeared to be an average 6.9% drop in performance in all positions after fatigue set in.

Conclusions/Discussion
There were clear performance differences in grip strength determined by habd position.

Summary Statement

This project examines hand position and how it affects grip strength and muscle fatigue with repetative motion.

Help Received