



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Kristen A. Aguanno	Project Number S1001
Project Title A Study Comparing the Respiration Rate to Weight Ratio of Two Different Families of the Order Cetacea	
Abstract Objectives/Goals My objective was to study two different families of the order Cetacea and find out if the respiration rate to weight ratio will differ between different age groups of <i>Orcinus orca</i> of the family Delphinidae, and <i>Delphinapterus leucas</i> of the family Monodontidae. Methods/Materials I went to Sea World, San Diego, CA and San Antonio, TX, to collect the respiration rate to weight ratios for ten killer whales and ten beluga whales. My data included ten trials for each whale for a total of 200 trials. Results The results show the killer whales' respiration rate to weight ratio was affected by age when comparing younger whales to older whales. Also the beluga whales' respiration rate to weight ratio was affected by age when comparing younger whales to older whales. When comparing the killer whales' and the beluga whales' respiration rate to weight ratios, there were no similarities between the two families. Conclusions/Discussion My hypothesis was not supported. When studying two different families of the order Cetacea, the respiration rate to weight ratio did differ between different age groups of <i>Orcinus orca</i> of the family Delphinidae, and <i>Delphinapterus leucas</i> of the family Monodontidae.	
Summary Statement When studying two different families of the order Cetacea, the respiration rate to weight ratio did differ between different age groups of <i>Orcinus orca</i> of the family Delphinidae, and <i>Delphinapterus leucas</i> of the family Monodontidae.	
Help Received My mother and father bought me a pass to Sea World and took me to both Sea Worlds. My father also helped me with my board.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Peter Aoun; Timothy Jones	Project Number S1002
Project Title Phase 3: Enhancement of Spatial-Temporal Reasoning in Mus musculus domesticus via Generalized Mozart Effect	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Mozart affects the firing patterns in the mammalian columnar cortex, used in spatial-temporal (ST) reasoning. An animal model of the #generalized Mozart effect#--enhanced higher brain function in response to exposure to music--was established by Phase I. Phase II determined that the generalized Mozart effect lasted at least 6 hours after exposure to music; this long-term causal enhancement suggested clinical relevance in potential use of this effect treating epilepsy. After receiving a positive response from the research community, Phase III tests the longevity of the effect through implementation of increasing time-lapses of auditory stimuli, suggesting permanent enhancement of brain function.</p> <p>Methods/Materials 40 mice were exposed to music for 10 weeks before testing. Music was edited to have a properly timed music dosage, bringing the stimuli exposure into clinical relevance with limited human exposure. To assess the effects of a time lapse, this protocol was used: Day 1, music was stopped 6 hours before testing. Day 2, a longer time lapse of 8 hours was used. Music was stopped 8 hours before the maze runs for the day. Day 3, 10 hours, Day 4, 12 hours. Day 5, the music was stopped entirely for the full day before the maze run is done. Each subject performed 3 trials daily.</p> <p>Results Our hypothesis was correct. The ST reasoning abilities of mice exposed to Mozart were consistent despite an increasing time-lapse. This indicates that the exposure to the music made neuropsychological changes to the mice, likely due to the neuroplasticity of the mammalian brain.</p> <p>Conclusions/Discussion These studies link neurophysiology with behavior by using control music demonstrated to not preferentially activate specific spatial-temporal cortical regions in fMRI studies; based on the regions activated it is predicted whether a piece will enhance ST ability in a behavioral study. Beethoven#s Fur Elise is a suitable control on the basis of its differential cortical activation patterns observed in fMRI studies compared to the Mozart Sonata, consisting of reduced or absent activation of areas associated with ST reasoning--particularly prefrontal cortex, occipital cortex, and the cerebellum. If precise exposure to the complexities of Mozart excites the cortical columns in the brain sufficiently to result in a normalizing effect, there is clinical significance in the non-invasive treatment of epilepsy.</p>	
Summary Statement Laboratory mice were exposed to Mozart and their spatial-temporal learning tested throughout the implementation of increasing time-lapses of auditory stimuli.	
Help Received None.	



CALIFORNIA STATE SCIENCE FAIR 2004 PROJECT SUMMARY

Name(s) Gian-Marco Ciallella	Project Number S1003
Project Title Bat Grip and Hand Muscle Fatigue	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to determine if holding the baseball bat in the correct position (with the proximal interphalangeal knuckles of both hands aligned) results in less hand muscle fatigue than other bat grips.</p> <p>Methods/Materials Informed consent (conforming with HIPPA regulations) was obtained from 10 subjects, 5 athletes, and 5 non-athletes. A preliminary fatigue test (consisting of catching a dropped yardstick as quickly as possible) was conducted on each subject to establish a baseline. Each subject swung a baseball bat 30 times in one minute holding the bat with 1) The Correct Grip, 2) Incorrect Position # 1, 3) Incorrect Position #2, and 4) Correct Grip Retest. After each swing test, a fatigue test was done three times, and the results were averaged and recorded for each subject.</p> <p>Results In the Athletic group, the Position 1 mean was 6.2 inches compared to 7.0 inches for Position 2 (incorrect #1) and Position 3 (incorrect Position #2) which was 7.8 inches. In the Non-Athletic group, the mean was 8.8 inches for Position 1 compared to a mean of 9.2 inches for Position 2, and Position 3, which had a mean of 9.3 inches (n=5). Even after three swing trials, the mean for the retest of the correct grip was less than the incorrect grips tested earlier.</p> <p>Conclusions/Discussion The correct grip caused less fatigue than the two incorrect grips. The data was compared using a paired t-test and was found to be significantly different with P values of 0.05 or lower. Position 1 (Pos.1), the correct Position vs. Pos.2 (incorrect Position #1) was significantly different (P=0.007513). Pos.1 vs. Pos.3 (Incorrect Position #2) also had P<0.05. Position 1 vs. the Re-Test of Position 1 had a p-value greater than 0.05 showing that the two tests of the same grip were more or less the same. Athletes seemed to train themselves to watch and react to the falling yardstick, often competing to beat the previous measurement. From the first test to the last test there was a learning curve which took place, but despite this there was still a significant difference in hand muscle fatigue in both the athletic and non-athletic subjects using the correct grip Position 1, and the other bat grips used. With this information, baseball players can reduce hand muscle fatigue, and may reduce injuries that occur as a result of fatigue, while improving performance.</p>	
Summary Statement This is an investigation of whether holding a baseball bat with the proximal interphalangeal joints aligned in both hands causes less muscle fatigue than gripping the bat with any other alignment.	
Help Received My science teacher, Leslie Gushwa, helped me with statistics and proofreading. My mother, a physical therapist, was a source of information, encouragement, and motivation. The San Dieguito Academy JV baseball Team supplied athletic test subjects.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Briana C. Cureton	Project Number S1004
Project Title The Formation and Prevention of Cataracts in Cow Eye Lens	
Abstract Objectives/Goals This experiment examines the formation of a type of cataract in a cow eye lens. The reason cow eyes were used is because of the similar size of cow eye lenses in relation to the human eye. Methods/Materials To preform these experiments a high intensity 300watt halogen light is positioned over the lens and the progression of cloudy changes in the lens is monitored. Different barriers are used to protect the lens from cataract formation. For example, clear glass, orange barrier, and dark lenses. Results This experiment shows that any type of protection will help slow down the process of the formation. The clear lens will protect the eye but not as well as the orange barrier does. Furthermore, the dark lens is the best protectoe out of all three barriers. Conclusions/Discussion As long as the lenses change from clear to cloudy, less light is transmitted through them. The radiometer measured that transmitted light and the results were graphed for each series. By protecting the cow lens with various barriers it will reduce milky clouding of cow's eye lens created by high intensity light. This experiment demonstartes dramatically the environmental dangers that we all face, day in and day out.	
Summary Statement The formation of catarcts in cow eye lenses from exposure to high intensity light are reduced with the use of colored barriers.	
Help Received Dad help me set up and get the supllies, Dr. Sammet helped me understand more about cataracts and how to get my project to work, Ms. Elder helped me set up my poster board and format my report.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Jonathan R. Glicksberg	Project Number S1005
Project Title Is Flaw Recognition Genetic?	
Abstract Objectives/Goals Members of four generations of my family have the special ability to easily find four-leaf clovers, leading me to hypothesize that flaw recognition has a genetic basis. I designed this experiment to determine if the ability to recognize visual flaws is inherited as a Mendelian trait. Methods/Materials I designed five repetitive geometric patterns and made three replicates, each with a deleted segment in a different position. The patterns were: 1 - circles, 2 - small repeats of stars, 3 - dogbones, 4 - large repeats of stars, 5 - angular flower petals with central spokes. Informed consent was obtained from 18 males and 18 females from eight families. Subjects searched for the flaws in 15 timed trials and were classified as finders for a specific pattern if they found the flaw a minimum of two times out of three trials. Results After classifying the individuals by their finder or non-finder phenotypes for each pattern and comparing their time scores, standard deviations and Student's t-tests showed that the phenotypes were significantly different. The flaw-detection scores were independent of age and gender, but did correlate with self-evaluation of visual-spatial ability. The inability to find the flaws in patterns 1 and 2 is consistent with autosomal recessive inheritance of two different traits. Conclusions/Discussion When finder vs. non-finder phenotypes for all five patterns were superimposed on pedigree drawings, intrafamilial similarities were obviously more common than interfamilial similarities. In addition, the inability to recognize flaws in patterns 1 and 2 both exhibited possible autosomal recessive inheritance, although these traits are not linked. My hypothesis was correct. There appear to be genetic components for the ability of humans to detect flaws in circular and small-repeating patterns.	
Summary Statement I found a likely genetic basis for the ability to recognize visual flaws in two geometric patterns.	
Help Received Parents provided transportation. Mother helped with Excel.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Megan M. Lee	Project Number S1006
Project Title Ammonia: The Passed Gas	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals My project was to determine if a horse's diet affects the amount of ammonia produced in their manure. I believe that, when boiled, the manure sample from a pregnant female horse will have a higher concentration of ammonia than the manure samples from three other horses.</p> <p>Methods/Materials Manure samples from four different horses were collected. 10g of manure was measured, placed in a clean flask, and then filled with 200mL of deionized water. The pH level of the water/manure mixture was measured. A beaker was then filled with 500mL of deionized water and its pH level measured. A hole was made through a cork stopper. One end of a U shaped piece of glass tubing was inserted into the stopper. The stopper was placed in the flask. The other end of the tubing was placed over the beaker of deionized water. The flask was placed directly on the hot plate/griddle while the beaker was set to the side away from the heat. The hot plate/griddle temperature was set to 5 and I waited for the manure/water mixture to boil. The mixture continued to boil until the water moved through the tubing into the beaker. I waited until the water moving through the tubing into the beaker turned a light shade of green and then turned off the hot plate/griddle. The pH level of the water in the beaker was measured a second time. Process was repeated for all manure samples. The pH levels were recorded and compared. The second pH level of the beaker water was plugged into the pOH formula. I then solved the equation to determine the ammonia content and compared those findings.</p> <p>Results The manure from the outdoor female pony using a salt lick had the higher ammonia level while the manure from the male horse living indoors consistently had the lower concentration of ammonia. Meanwhile, the manure from the pregnant indoor female horse had ammonia levels that were often equal to that of the male horse living outdoors. There were no changes in the ammonia level from the pregnant female after she delivered her foal.</p> <p>Conclusions/Discussion My conclusion did not support the project's hypothesis. The female pony living outside utilizing a salt lick had the higher ammonia concentration in its manure as opposed to the other subjects not having access to salt licks. Living conditions did not affect the final results. This was concluded by a testing method using a beaker and tubing system to extract ammonia from each manure sample.</p>	
Summary Statement To determine the relationship between a horse's diet and the affect it has on the ammonia level in their manure.	
Help Received I used lab equipment belonging to Mr. Beach's chemistry class; my test horses belong to my riding instructor, Stacey Turner; my grandparents allowed me the use of their home to conduct the bulk of this experiment; my mother and aunt transported me where I needed to go to get this project completed.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Cody R. Lewis	Project Number S1007
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Project Title
Utilizing Counter-Movement Medicine Ball Throws to Increase Elite & Non-Elite Athletes' Vertical Jump Heights-2 yr Study

Abstract

Objectives/Goals
Throughout history, many athletes have been forced into early retirement due to knee injuries and joint inflammation. The constant pounding on knee joints of athletes, in volleyball especially, can lead to an abrupt career end. This project was designed to increase an athlete's counter movement vertical jump (CMVJ) height by using repetitions of counter movement medicine ball throws (CMMBT).

Methods/Materials
This project was conducted in 3 trials over a 2-yr period, culminating in 24,859 CMMBT's.
Trial #1: Non-elite high school athletes (males and females) threw a 4kg medicine ball 20x, 3x/wk. Every 3 wks, the experimental group (students throwing the medicine ball) and a non-throwing control group were tested for their maximum CMMBT throw and CMVJ height. This 15-wk trial was conducted in 2003.
Trial #2: Elite collegiate volleyball players (males) threw a 4.54kg medicine ball 20x, 3x/wk. Every 3 wks, the experimental group and a non-throwing control group were tested for their maximum CMMBT throw and CMVJ height. This 8-wk trial was conducted in Oct.-Dec. of 2003.
Trial #3: Club volleyball players (females, 17-18 yrs old) threw a 4kg medicine ball 20x, 2x/wk. Every 3 wks, the experimental group and a non-throwing control group were tested for their maximum CMMBT throw and CMVJ height. This 12-wk trial was conducted in Jan-March of 2004.

Results
Trial #1: the non-elite, male experimental group increased their CMVJ height (average) 2.0 inches ("). The male control group decreased (avg) 1.0". The non-elite, female experimental group increased their CMVJ height (avg) 1.8". The female control group decreased (avg) 2.2".
Trial #2: the elite, collegiate male experimental group increased their CMVJ height (avg) .5". The control group decreased (avg) 1.4".
Trial #3: the female, club volleyball experimental group increased their CMVJ height (avg) 1.0". The control group increased (avg) 2.0".

Conclusions/Discussion
Overall, the data did support the hypothesis. The results in Trials #1 and #2 show that it is possible to raise both elite and non-elite athletes' CMVJ height by an exercise regime that includes throwing a 4-4.54kg medicine ball 20x, 3x/wk. Trial #3, showing increases in both groups, did not support the hypothesis. This was probably due to the lower number of throws/wk (60 throws/wk in Trials #1 and #2 vs. 40 throws/wk in Trial #3).

Summary Statement
This project was designed to increase an athlete's counter movement vertical jump (CMVJ) height by using repetitions of counter movement medicine ball throws (CMMBT).

Help Received
Marv Dunphy (Pepperdine Head Men's Volleyball Coach) and Seth Burnham (AVVC 18-1's Head Girl's Volleyball Coach)- granted player usage. Dr. R. G. Haennel (University of Regina)- supplied the "Lewis Formula."



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Tabatha M. Mills	Project Number S1008
Project Title The Correlation of Sperm Life Expectancy to the Rotation of Semen	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Artificial insemination has become a standard practice in the modern swine industry. Proper handling of semen is crucial for success(Ladd, 2003). Can the correlation of life expectancy in sperm to the rotation of semen become the standard of proper handling?</p> <p>Methods/Materials 200 microtubules holding 1cc of New Age Outlaw smen from Lean Value Sires were separated into four groups of 50, determined by color. 100 tubules were stationed horizontally. 50 of those 100 were rotated every day at seven o'clock a.m. The next 100 were stationed vertically. 50 of those 100 were rotated every day at seven o'clock a.m. This process was conducted for 10 consecutive days.</p> <p>Results There was only a 10% difference of live sperm between the stationary and the rotated tubules.</p>	
Summary Statement The rotation of Semen	
Help Received	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Azaam M. Samad	Project Number S1009
Project Title Tea Extracts Inhibit the Proliferation and Differentiation of Adipocytes	
Abstract Objectives/Goals Obesity is a major public health problem and in the U.S. alone more than 65% of the adult population is overweight or obese. The result of this epidemic is an increase in obesity-related diseases such as cardiovascular disease, diabetes and cancer. Since several studies have documented the health benefits of tea, in this study, the hypothesis that black and green tea extracts may inhibit the proliferation and differentiation of adipocytes was evaluated in vitro using the murine 3T3-L1 pre-adipocyte cell line. Methods/Materials Cells were grown in 6-well tissue culture plates in Dulbecco's Modified Eagle's Medium (DMEM) containing 10% fetal bovine serum, 1% Penicillin-Streptomycin, and 1% HEPES buffer. Confluent pre-adipocytes were differentiated into adipocytes in the above cell culture medium supplemented with 10micrograms/ml bovine insulin. Various concentrations (1%, 0.5% and 0.1%) of black and green tea extracts were added either to: a) pre-confluent 3T3-L1 adipocytes; or b) to confluent 3T3-L1 pre-adipocytes during the time of induction of differentiation into adipocytes with insulin. Results Green and black tea extracts inhibited the proliferation of pre-confluent pre-adipocytes in a time and dose-dependent manner as determined by cell counts using a hemacytometer. Black and Green tea extracts also dose dependently inhibited the differentiation of confluent pre-adipocytes to mature adipocytes. In this instance the tea extracts inhibited lipid (triglyceride) accumulation in cells as determined visually through microscopic examination and also by Oil-Red-O staining for lipids. Conclusions/Discussion These data demonstrate that constituents in black and green tea extracts are effective in inhibiting the growth and differentiation of adipocytes in vitro.	
Summary Statement My project determined whether black and greens tea extracts inhibited the growth and differentiation (i.e. lipid accumulation) of adipocytes.	
Help Received This project was carried out at the Scripps Research Institute, La jolla, CA, under the supervision of Dr. Fahumiya Samad.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Katherine Sengoba	Project Number S1010
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Project Title
Effects on Heart Rate and Cardiac Output on Model Heart When Tube Size Altered to Show Atherosclerosis and Valve Disease

Abstract

Objectives/Goals
The purpose of this project is to explore what happens to the heart rate and the cardiac output in hearts that have atherosclerosis in the aorta and valve disease on the mitral valve

Methods/Materials
A model heart was constructed from bottles, tubes, car valves and fountain pumps to carry out this experiment. Holes were drilled into the four bottles and valves with the help of tubing were put into them to represent the different valves of the heart. The bottles were connected to tubing, which was attached to pumps, which represented the heart's pacemaker providing the mechanism to pump the blood through the system.
Three experiments were done. The first experiment was to represent a normal heart. On the second experiment, representing atherosclerosis, a clamp was tightened on the tube that represented the aorta. This represented the plaque buildup in a living heart because the amount of blood flow was restricted. The third experiment represented valve disease and here the clamp was placed on the valve that would represent the mitral valve in real life. Because of the equipment used, the data that was collected was only that of the cardiac output. Therefore, it was realized that only by using the formula for cardiac output, deriving various formulas from it and the stroke volume of a real person under such conditions as those in the experiment, could the heart rates were determined.

Results
Normal Heart: Average Cardiac Output was 855. mL/min; Experimental Heart Rate Avg. was 12.2 beats/min.
Atherosclerosis Heart: Average Cardiac Output was 756 mL/min; Experimental Heart Rate Avg. was 13.8 beats/min.
Valve Diseased Heart: Average Cardiac Output was 751 mL/min; Experimental Heart Rate Avg. was 14.2 beats/min.

Conclusions/Discussion
The results of experiment mostly supported the original hypothesis. It was observed that the cardiac output and the heart rate were inversely proportional. The cardiac output of the heart with atherosclerosis was reduced compared to the normal heart, increasing the heart rate. In the heart with valve disease, the cardiac output was lower than that of the heart with atherosclerosis, which increased the heart rate to be higher than that of both the heart with atherosclerosis and the normal heart. The combination of the experiments showed that when various parts of the heart are manipulated the heart rate and cardiac output

Summary Statement
The project was about discovering how the heart rates and cardiac outputs of hearts with atherosclerosis and valve disease compare to that of a normal heart.

Help Received
My father was my partner in carrying out various parts of the experiment when taking the cardiac outputs.



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Zaven Tabakian	Project Number S1011
Project Title The Role of Krox-20, a Transcription Factor, in Craniofacial Muscle Development	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals To understand the effect of the Krox-20 mutant on jaw-opener development.</p> <p>Methods/Materials Mandibles with muscles attached were dissected from E14 embryos and mounted onto black filters (Millipore). Dissections were performed in Hanks Media (Gibco). Organ cultures were incubated at 37°C with 5% CO₂ in a culture medium consisting of 10% fetal calf serum (Gibco) with penicillin and streptomycin (Gibco) in BGJb (Gibco) for six days. Specimens were subsequently fixed overnight in 10% buffered formalin and then dehydrated in graded ethanols and embedded in paraffin. The paraffin-embedded blocks were serially sectioned at 6 µm. For every group of twenty sections, ten serial sections were processed for counterstaining with hematoxylin and eosin and the other ten serial sections were processed for either TUNEL staining using the In Situ Cell Death Detection Kit (Roche) or for proliferating cell nuclear antigen (PCNA) expression, using the PCNA Staining Kit (Zymed). Cell counting procedures were performed for all these studies and one- way ANOVA were conducted to determine differences between genotypes.</p> <p>Results Krox-20 null mutation impacts the development of masticatory muscle development. Mandibular/jaw-opener muscle organ culture preparation supports the growth of jaw-opener musculature. The Krox-20 null mutation does not influence jaw-opener muscle proliferation. The Krox-20 null mutation increases cell death in jaw-opener musculature.</p> <p>Conclusions/Discussion Krox-20 expression has a role in maintaining jaw-opener musculature. Krox-20 expression suppresses cell death programs. Data suggest that a muscle disorder may be implicated in the disease course associated with EGR2 mutations that result in feeding disorders.</p>	
Summary Statement The Role of Krox-20, A Transcription Factor, in Craniofacial Muscle Development	
Help Received Jack Turman, Jr. Ph.D., Shampa De, Daniel Li	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Kaitlin M. Walker	Project Number S1012
Project Title A pHantastic Way to See How Exercise Affects CO(2) Production	
Abstract Objectives/Goals To explore the effects that different types and durations of exercise have on the production of CO(2) in humans. To demonstrate how when people exercise, they burn adenosine triphosphate (ATP). During the process of burning ATP, muscles need oxygen and get rid of CO(2). When CO(2) is combined with H(2)O, it produces carbonic acid. By measuring the pH level of the H(2)O, we see how exercise affects the amount of CO(2) produced. Methods/Materials 60 subject were tested, 10 female and 10 male, in three age brackets. (13-19, 21-50, and 51-80 yrs) A baseline or control pH measurement was taken from H(2)O samples, prior to exercising. Then, each subject exercised for 5 minutes and blew into a straw submerged into H(2)O for 30 seconds. PH level was measured. Procedure was repeated three times. IV was different types of exercise, duration, and mean number of minutes exercised each week. DV was the amount of carbonic acid produced after exercising. Results Hypothesis was supported. When people exercise, they burn ATP, expend energy, and exhale CO(2), as a result of cellular respiration. Whe CO(2)is combined with H(2)O it forms carbonic acid and lowers the pH of the H(2)O sample. 97% of subjects produced measurable carbonic acid following exercise. There was evidence that they were burning ATP. This increased to 88% following the second set of exercises. Conclusions/Discussion The duration of exercise had an impact in reducing pH levels, however, the type of exercise engaged in did not impact the results. The 51 to 80 age group produced the most dramatic decreases in the pH level, as they exercised. The actual pH level never exceeded 4.5, regardless of the amount of exercise performed. The number of minutes that a person exercised each week did not impact carbonic acid production while exercising, as I predicted that it would.	
Summary Statement An exploration of the effects that different types and durations of exercise have on the production of CO(2) in humans.	
Help Received The Ventura Adult Education exercise group participated as subjects in the 51-80 age group.	



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Nicole M. Young	Project Number S1013
Project Title The Effect of Body Symmetry on Athletic Ability	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The main objective/goal in this project is to see if there is a correlation between body symmetry and athletic ability, and if so to what degree does body symmetry effect athletic ability.</p> <p>Methods/Materials In this project the main tool used was a digital measuring caliper. Using this device I was able to measure 40 high school students for body symmetry. Out of the 40 subjects, 20 were athletic, and 20 were non-athletic, and in each catagory, 10 were female and 10 were male. To determine body symmetry, 8 measurement were taken from each person: ear width and length, elbow width, wrist width, index and ring finger width, ankle width, and foot width. Each side of the body was measured twice to reduce measurement error. I also asked each subject their 1 mile run time, and the number of hours a week they participated in a physical activity. This information determined if the subhject was athletic or non-athletic. I then inputed all the collected data into a spread sheet and found out the asymmetry index for each person. The asymmetry index is the percent out of 100 the subject is symmetrical, 0 being perfectly symmetrical.</p> <p>Results In this experiment I found that the asymmetry index for the athletic subject was 19.7%, while the asymmetry index for a non-athletic person was 26.4%. There was a 6.7% difference between the atheltic subject, and non-athletic subject. The athletic subjects also ran a 50 second faster mile time compared to that of the non-athletic subjects.</p> <p>Conclusions/Discussion I conclude that there is a definent correlation between body symmetry and athletic ability, and my results support my hypothesis. One interesting thing I found while doing this experiment was that one individual, who participated in a physical activity the longest (in hours) also happened to be the most symmetrical (had the lowest asymmetry percent). This information can be used by coaches who want to help their athletes by giving them exercises to improve their symmetry. Not everyone is perfectly symmetrical and it would be interesting to see if certain exercises would improve asymmetries.</p>	
Summary Statement My experiment focuses on the effect of body symmetry on athletic ability, by measuring certain body parts of both athletic and non-athltic individuals, this correlation can be made.	
Help Received Dr. Jay Phelan helped with procedure, participant in Junior Southern California Academy of Sciences program (JSCAS)	